Digitized by Google

Original from
THE OHIO STATE UNIVERSITY



Digitized by Google
Original from
THE OHIO STATE UNIVERSITY

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

BARTON
COLLEGE
LIBRARY

DISCARDED BY
DARTMOUTH COLLEGE LIBRARY

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

The
OPTICIAN
And SCIENTIFIC
INSTRUMENT · MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1587 FRIDAY, AUGUST 26, 1921.

Wellsworth Fits-U Eyeglass Chains

One of the very popular styles of Wellsworth Eyeglass Chains is that with the Fits-U snap. This style snap is a very simple and effective means of attaching a chain to a rimless lens. In reality it is not a snap at all, but simply a little button no larger than a pinhead, just large enough so that it cannot be pulled through the lens hole. It is so small that it is nearly invisible, and when worn with an ear loop chain is the most inconspicuous of chains.

The quality of Wellsworth "Fits-U" Eyeglass Chains is of the same high character that gives all Wellsworth products their reputation for being unexcelled.

Supplied in Solid Gold and Gold-filled.



The above illustration shows the simpleness and inconspicuousness of Wellsworth Eyeglass Chains with Fits-U snap.

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

AMERICAN OPTICAL COMPANY, LIMITED,

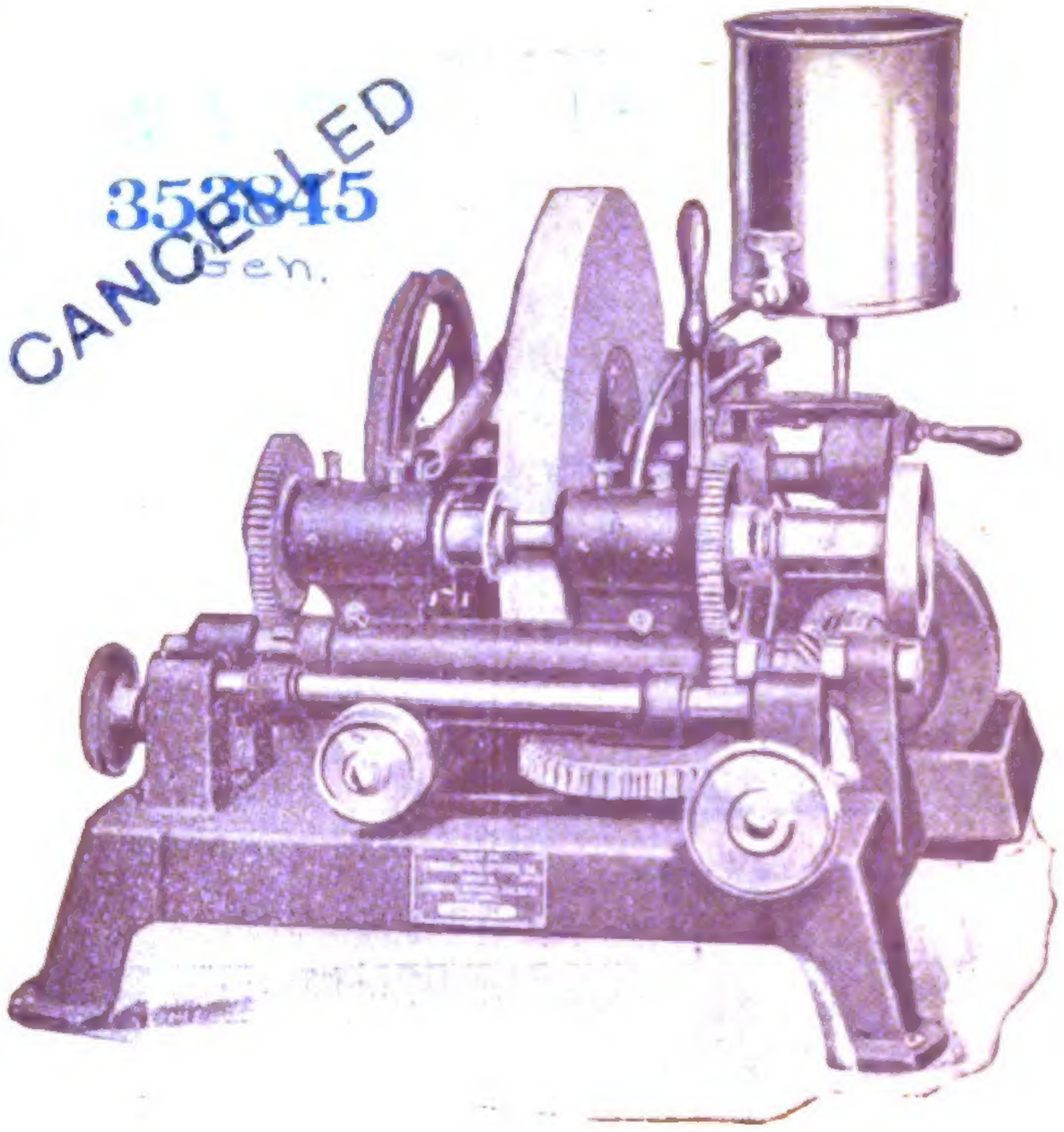
39, Hatton Garden, LONDON, E.C.1

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Reg'd at the G.P.O. as a newspaper **PRICE 4d** *Subscription post free 12 months 17s*
Postage in United Kingdom 1d

CANCELLED 352845 Gen.

"CONSOL" JUNIOR AUTOMATIC RIMLESS LENS EDGER.



The "Consol" Junior Automatic Edger has been specially designed to meet the demand for a machine that will operate in a limited space, and grind from one to six lenses at a time. It requires a bench space of only 15″ x 18″ and can be operated by a 1/6 H.P. Motor driven from an ordinary lamp socket.

The "Consol" Junior will do any and all work the larger machines are capable of.

Although its stone is smaller in diameter, it travels past the lens at the same speed the larger stones do, and therefore cuts just as quickly.

It will also cut as clean and as accurately, and will grind any size, shape or thickness of Lens.

The stone will last a lifetime, in fact it will outwear the rest of the machine.

In designing the "Consol" Junior Edger, we did not try to develop a machine down to a price, but rather we tried to build a machine that would be above *all* competitors in ability and accuracy, and at the same time would have an appearance and finish that would be a credit to any Optical Workshop.

The following accessories are included:—

1. Lens Holder.
6. Lens Formers, 6, 7, 8, 9, Leaf shape and round.
4. Rubber Rings for Lens Holders.
12. Rings for spacing Lenses.
1. *Trueing* Device (attached permanently at rear of stone).

"CONSOL" MACHINERY CAN BE OBTAINED THROUGH ANY OF THE WHOLESALE OPTICAL HOUSES, or from

THE GENERAL OPTICAL Co. (E. T. & F. W. Cornwell),

32, ELY PLACE, HOLBORN, LONDON, E.C.

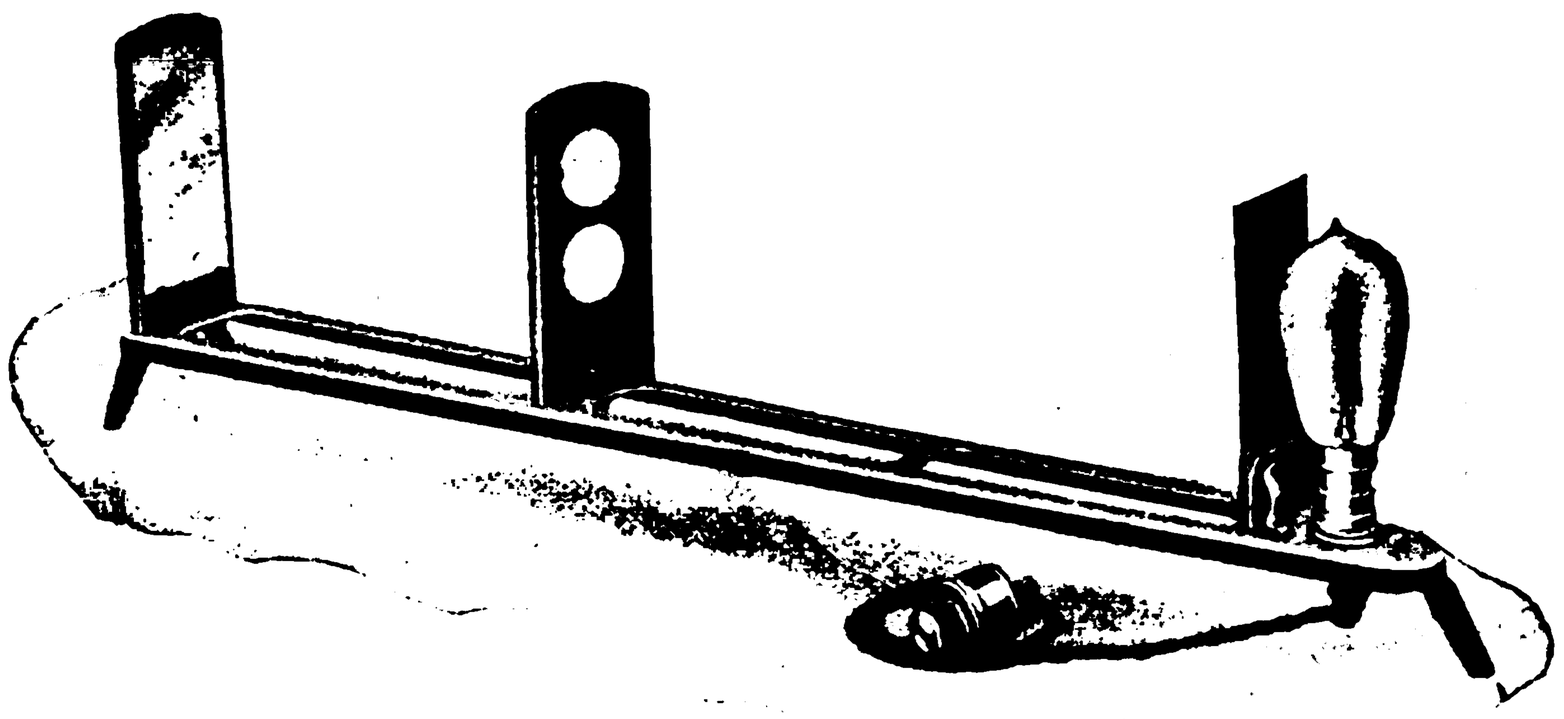
Who are the sole distributors of "Consol" Machinery Products.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The "RAPID" Curved Lens Demonstrator

Patent No. 112074



A MOST CONVINCING DEMONSTRATION OF THE ADVANTAGES GAINED BY USING TORIC OR MENISCUS LENSES IN THE PLACE OF BICONVEX OR BICONCAVE.

Particulars and Price on Application.

GEORGE CULVER LTD.,

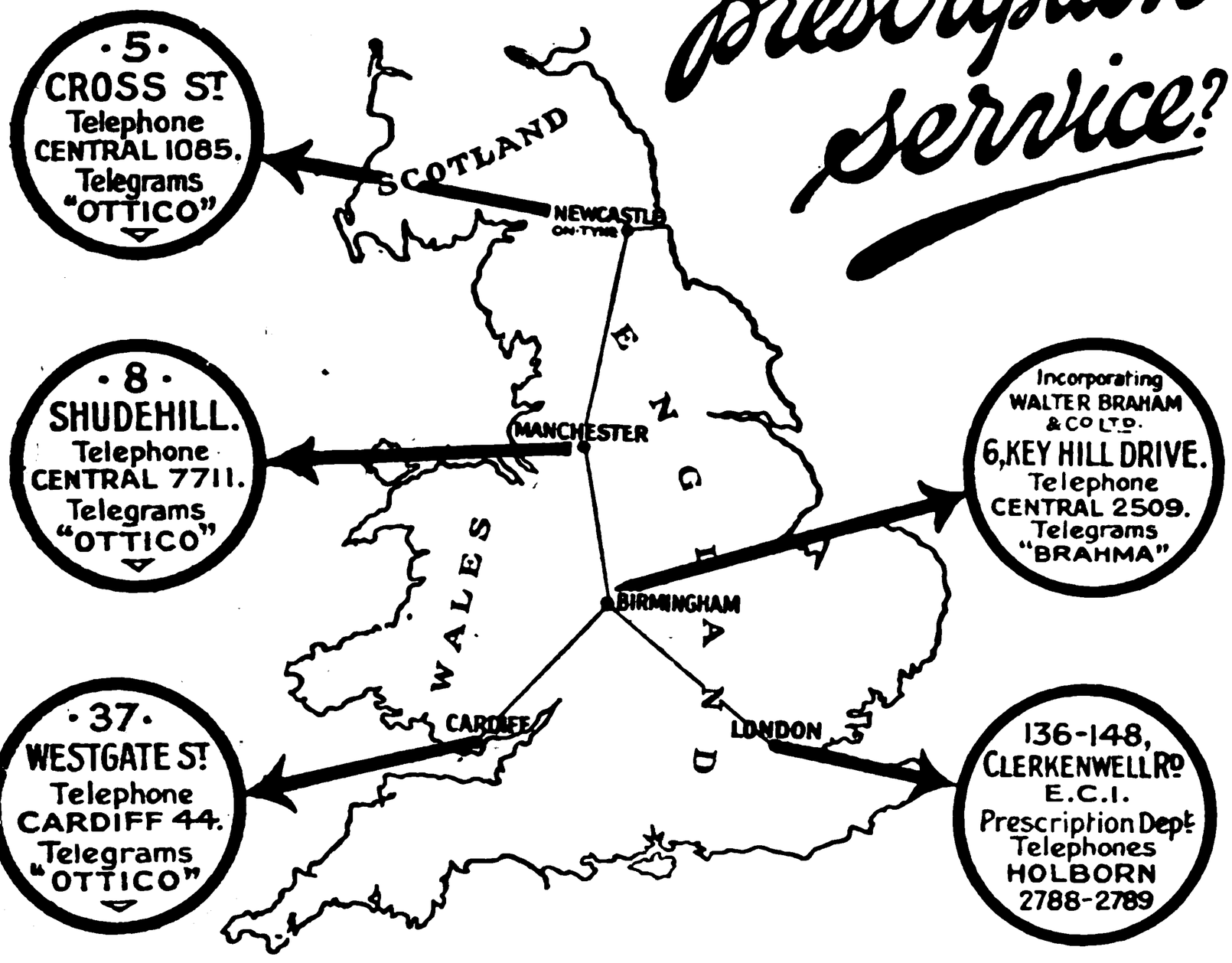
Manufacturing Opticians,

PENTONVILLE, N.1

Digitized by Google 843833 Original from THE OHIO STATE UNIVERSITY

J&R.F LTD

Why not link yourself with our prescription service?



Each Branch has a Complete Prescription Equipment.

LINK QUALITY SERVICE BRAND
Reg^d Trade Mark.

J & R. Fleming Limited.

136-148. Clerkenwell Road, LONDON, E.C.1.

Telegrams: "OTTICO" SMITH, LONDON.

J&R.F LTD

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
Col. & Ald. Sir CHARLES C. WAKEFIELD, Bt., C.B.E.

Upper Warden
The Rt. Hon. VISCOUNT HILL.

Renter Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Director of Examinations
The Rt. Hon. Sir WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS

of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in November, 1921.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,587

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices
123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, AUG. 26, 1921.

The Key Industries Act.—Having received the Royal assent last Friday, the Safeguarding of Industries Bill is now an Act of Parliament. For some reason which we do not profess to understand, copies of the Act are not yet available as we go to press. Most of the matter being presumably already standing in type, the production of copies for the information of the public would be a matter of a few hours with a commercial printer. However, no doubt the proof sheets of an Act of Parliament have to be carefully scrutinised by the Government's legal experts. We expect to be in a position to reproduce the text next week.

* * *

The Anti-German Bias in Trade.—There is no questioning the very considerable extent to which British manufacturers are "protected" against the German by a barrier of sentiment. It extends much further than among those men and women who have suffered lasting grief from bereavement in a war of German making. War, notwithstanding the losses it inflicts, has been followed by quick reconciliation; and an outstanding example was given by the South African War, in

Digitized by Google Original from THE OHIO STATE UNIVERSITY

which this country was engaged with a people of Teutonic race. Quite another factor has enhanced and maintains the national prejudice against Germany, and so incidentally against German manufactured goods. Hysterical journalists, who preached that Germans had a monopoly of cruelty in the fighting line, have been forgotten; but the fact is notorious that, both on sea and land, the Germans introduced some novel refinements of their own into an essentially savage business. As effective as this, or probably more so in its influence on "sentiment," was the gross degradation inflicted on prisoners and conquered peoples. The reversal of those rules of conduct which have been held in esteem by cultured nations since the age of chivalry, produced a deep impression. The prejudice against Germany to-day is, therefore, very much stronger than might have been anticipated, when the War, destined to be so splendidly successful, was imposed on us.

* * *

Course of Resumption of Commerce.—Economic necessity must overrule the aversion to dealing with people who have shown themselves unchivalrous in war. Whatever the merits and demerits of Free Trade as a political party principle, business men of every political creed will agree that free trading with all the peoples of the earth is a thing much to be desired from the commercial standpoint. Tariffs may be established in this country as in other countries; but whatever our views upon tariff questions, obviously, subject to the payment of the necessary duties, trading must be free if it is to be prosperous and so beneficial to one and all. "Prohibitions" in respect of trading may be enforced (more or less) by a horde of Government officials; or boycotts may be organised by interested parties, appealing to the natural and legitimate prejudices of their fellow countrymen; but in each case the scale is weighted in favour of the pious fraud. In each case, fortunes are to be made by those merchants who succeed in evading the barrier, whether by the favouritism that procures special licenses to import, or by the "passing off" of ex-enemy goods as perhaps goods of neutral origin.

* * *

Now the bureaucratic system of "prohibition" of imports, which has been so much talked of, is we think, rightly described as an economic absurdity. The other system (notwithstanding its drawback just mentioned) is legitimate enough; and we all know that some feeble attempts are made by those most interested to stimulate its operation. We say feeble attempts, because the lack of bold measures of publicity leaves the atmosphere a fictitious one. As our readers are aware, great quantities of German made goods are being sold in this country with, in many instances, "no questions asked." Not only some traders but very many members of the public, are swayed by the considerable financial advantage of accepting what is made in Germany. A reasonable course is to face that fact fairly; and now that, in the optical and scientific instrument industries, the price of German imports is to be raised, there is an improved prospect of converting the present buyers of German goods from what many think to be the error of their ways. An intensive campaign of advertising to the trade and, as far as practicable, to the public also, is the means by which optical and scientific instrument manufacturers who compete with German producers can bring home the excellent arguments that they have to adduce—on the score of quality and, in the case of British makers, on that of the advantage of supporting a home industry.

* * *

The Penalty of Inaction.—If this is not done, it may easily happen that comparatively little progress will be made, and so far as the tariff is concerned, our Key Industries Act will fail of its intended effect to benefit the nation. Advertising in the home and foreign markets should be directed to the real merits of the case, and not simply addressed to the much exploited sentiment of British patriotism. It is said and believed that the British optical manufactures are better and the German inferior to what they were before the War. But if as we think, this is the fact, certainly the grounds for it, or proofs of it, are not being prominently enough brought in evidence. We have paid tribute ourselves to the sentimental aspect of the matter by declining substantial offers of advertising from German makers; but this is only of negative import. It is for British makers themselves, with all the technical detail of their individual products at hand, to emphasise the superiority, both absolute and comparative, of instruments of British make.

Subscriptions to THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER date from the time of payment. Home 17s. and Abroad, 20s. for 52 weeks. Publishing Offices: 123-5 Fleet Street, London. E.C. 4.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Graphical Method of Designing Direct Vision Prisms.

By J. H. DOWELL.

To those who have found the designing of a direct vision prism by ordinary mathematical means a very lengthy and tedious operation, and one in which the effect of a proposed modification cannot very well be accurately judged, the following systematic method of graphically designing prisms may be of interest.

The method is applicable to all cases of refraction at plane surfaces, but I propose to deal mainly with direct vision prisms, as so far as I am aware, hitherto no systematic and simple means have been published showing how problems in connection with such prisms can be solved, also because the possibility of compound prisms in general does not seem to have received the amount of attention which it deserves.

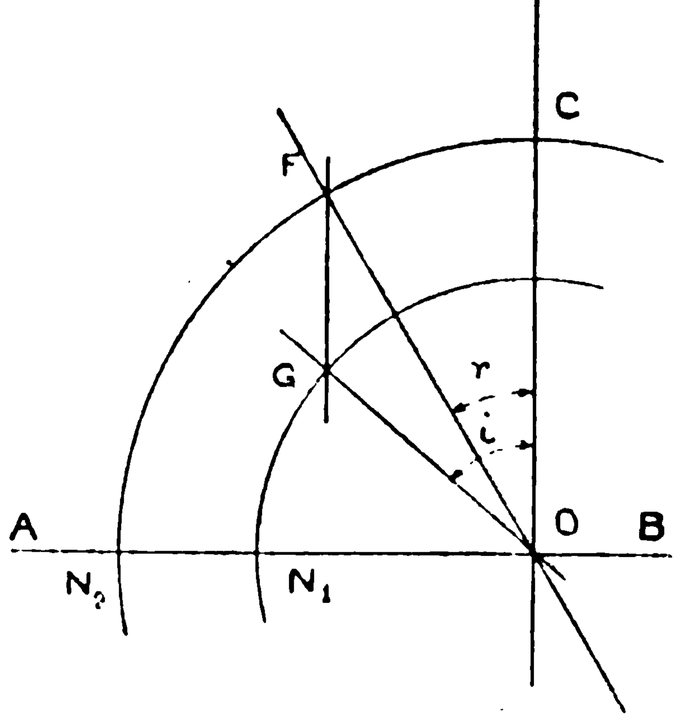


Fig. 1.

To be of any value the method used must be simple yet give results which are reasonably accurate. The following method fulfils both conditions, the accuracy being good enough for many purposes without the angles being checked by calculation, in fact the error in angular dispersion is not more than will be probable in actual manufacture. When the highest degree of accuracy is required, the angles should be checked by calculation, but it will be shown that this can be done with certainty and without trial and error, no matter how complicated the prism system may be.

I assume only that the reader is acquainted with Snell's sine law of refraction. There is a well-known graphical method of dealing with a ray refracted on passing from one medium to another. This method is shown in fig. 1 Let AB be the boundary surface between two media whose refractive indexes are respectively N_1 and N_2 and GO a ray with angle of incidence i to the normal CO. We desire to find the direction of the ray after refraction into the second medium with refractive index N_2. With the intersection point of the ray O as centre, describe two circles with radius equal to the refractive indexes N_1 and N_2 to any convenient scale. Through the point G where the incident ray cuts the circle with radius N_1 draw a line parallel to the normal CO. From the point F where this line cuts the circle whose radius equals N_2 draw a line through the intersection point O. This is the direction of the refracted ray in the medium whose refrac-

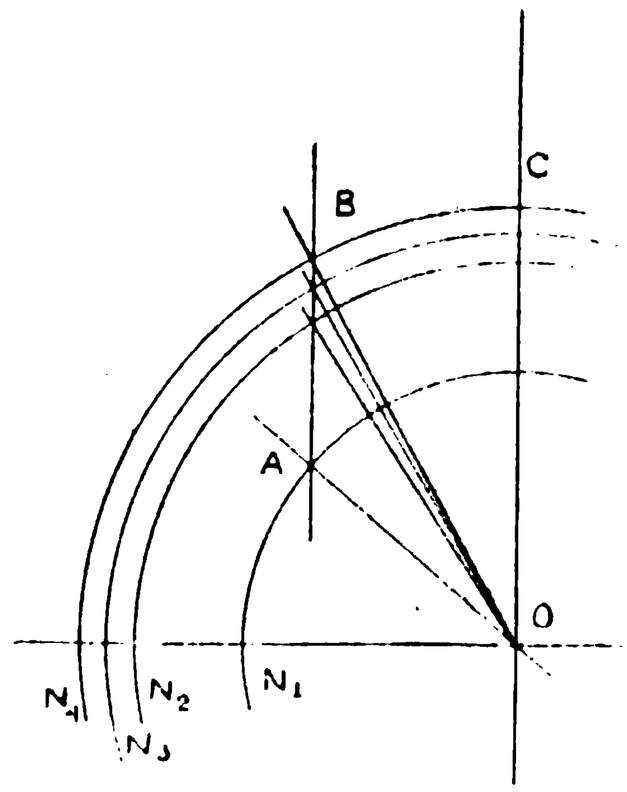


Fig. 2.

tive index is N_2. It might be noted in passing that the critical angle is found at once on such a diagram by drawing a tangent to the circle N_1 and normal to the boundary surface; the point where this line cuts the circle N_2 defines the critical angle.

We shall define the point where a ray making an angle θ to the normal cuts a circle whose radius is the refractive index N of the medium in which the ray is travelling, as being the *ray index point*; the line which is drawn through any ray index point parallel to the normal as the *surface normal*; the point where a ray meets the boundary surface of two media *the incident point*; and a line drawn at right angles to the boundary surface and

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

through the incident point simply as the *normal*.

Suppose a ray of say, white light passes from one medium to another; the direction of the refracted rays or dispersion for any wave lengths whose refractive indexes in the second medium are N_2 N_3 N_4 etc., are found by drawing circles with radii N_2 N_3 N_4 (fig. 2,) projecting a surface normal AB through the ray index point of the first medium, where this lines cuts the refractive

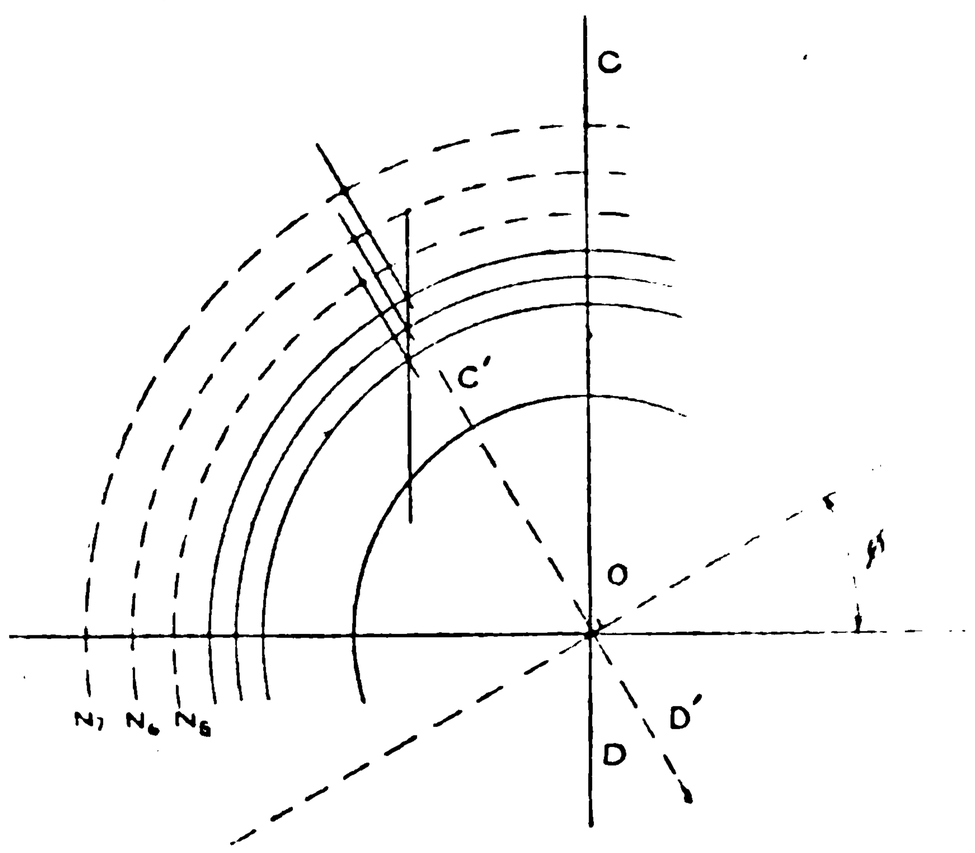


Fig. 3.

circles whose radius are N_2 N_3 and N_4 are the ray index points in the second medium.

Now consider the case where a ray dispersed as above travels on and meets a second surface and third medium whose refractive index for the wave length under consideration are N_5 N_6 and N_7.

Let the second surface make an angle ϕ with the first as shown in broken lines in fig. 3. Through the ray index points of N_2 N_3 and N_4 draw surface normals (note that they will make an angle to the normal of the first surface equal to ϕ); where they cut the N_5 N_6 and N_7 circles we have the ray index points for the third medium.

In fact it is only necessary to draw circles of refractive index for any given wave length and project the surface normals to the corresponding circles of retractive index for any number of media in order to find the final direction and amount of dispersion, which is, of course, obtained by drawing lines through our final ray index points and the incident point O.

What could be more simple or convenient? Lengthy calculations can be performed in a few moments with surprising accuracy.

Let us now consider the case of a typical direct vision prism of three components, fig. 1. The prism is to be direct for a given wave length λ_2 and have a dispersion of δ degrees for wave lengths λ_1 and λ

Suppose the refractive index of the two outer prisms for wave length λ_1 λ_2 and λ_3 are N_1 N_2 and N_3 and the corresponding refractive index for the centre prism be N_4 N_5 and N_6. Draw a line representing the optical axis, and to any convenient scale (I generally make

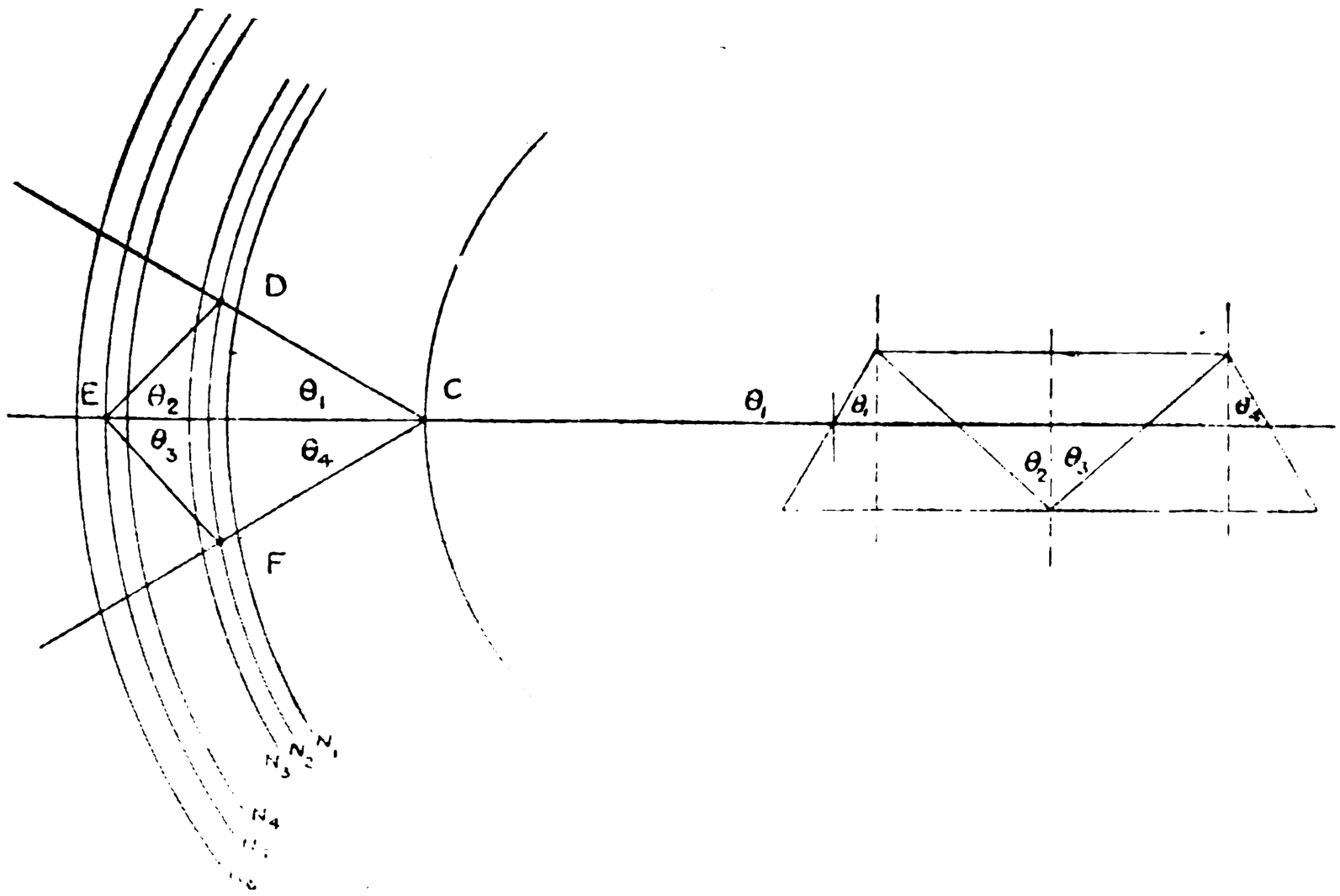
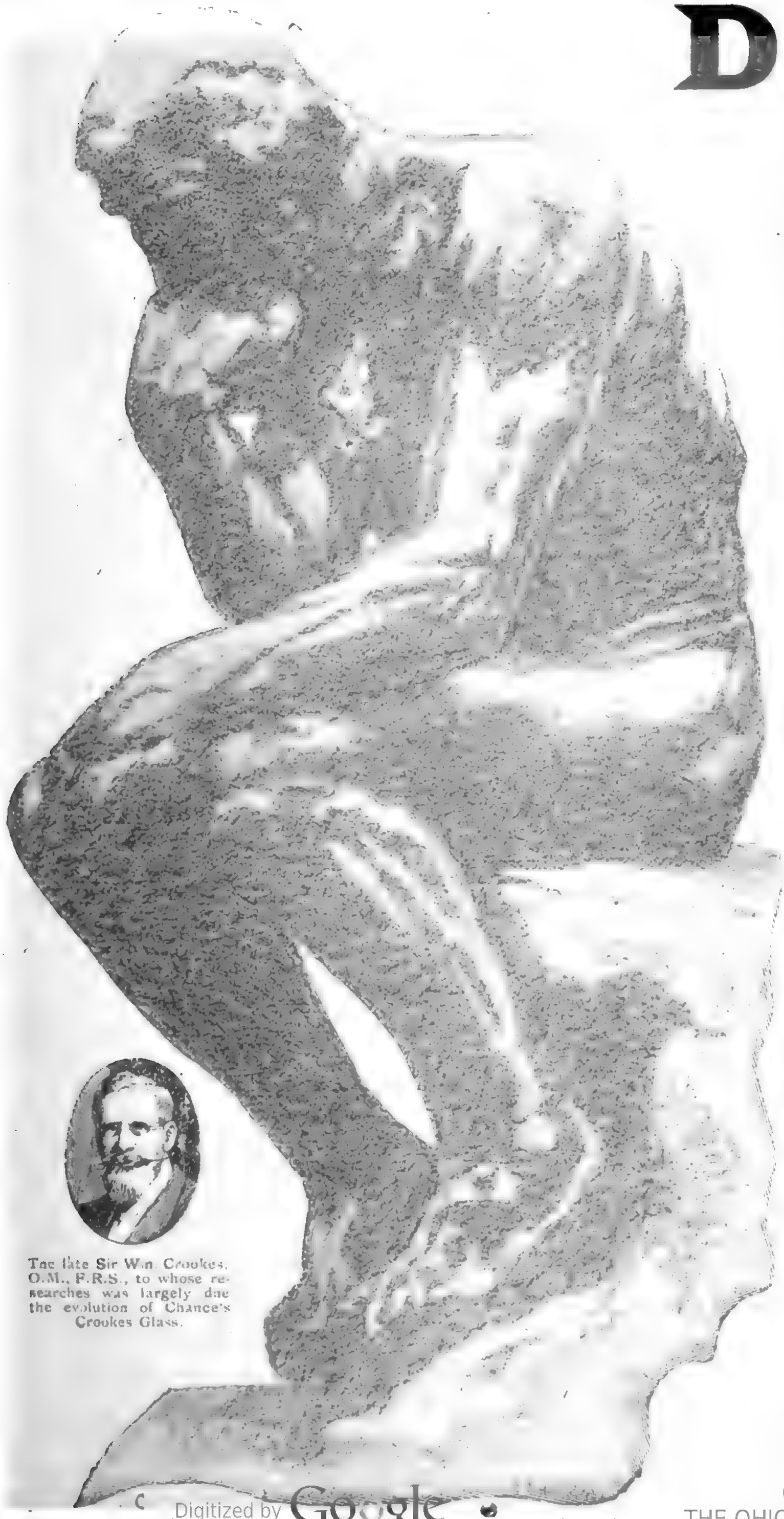


Fig. 4.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



The late Sir Wm. Crookes, O.M., F.R.S., to whose researches was largely due the evolution of Chance's Crookes Glass.

Dumb.

Rodin's statue whispers of the mute struggle for expression which took place in men's souls when thought began to stir in the world. While man was yet dumb, he strove for speech, and from his struggles our present state has issued.

To communicate ideas is to stimulate thought and life. Without communication, nothing new can be told.

An instance.—Chance's "Crookes" Glass exists; but, for those who have not been told of it, might just as well be non-existent.

We can help you to tell your own public *what*

Chance's CROOKES Glass

is, and that *you* can show it to them. We have the blocks for special small-space advertising ready, can show them to you and will let you have them free. Many opticians have widely increased their clientele in this way.

CHANCE BROS. & Co., Ltd.,

Glass Works, Smethwick.

An instrument is now on the market to demonstrate to the public the efficacy of Chance's "Crookes" Glass in cutting off the harmful light rays.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Phone:—City 3225 (3 lines) *Telegrams :—Bulford, BARB. London.*

There is a Charm about

Real Tortoise Shell

The Exclusive Models

made by us ADVANCE THE ART.

Real Shell Spectacles with Silver joints and inserted sides.

ditto Gold ditto

ditto Gold joints and sides

Real Shell Spectacle Front and "Inviso" cable sides.

Gold "Inviso" Mounts with Real Shell Rims.

Gold "Ace-of" Mounts with Real Shell Rims.

ETC., ETC.

Made by the firm whose Reputation for Prescription Work is :—*"Second to None."*

NEWBOLD & BULFORD, ***Prescription House,***
GOSWELL ROAD, LONDON,
E.C. 1

Digitized by Google Original from THE OHIO STATE UNIVERSITY

10″=1.0) circles whose radii are N_1 N_2 N_3 N_4 N_5 and N_6 about a point O. Also draw a circle whose radius equals unity to the same scale to represent the refractive index of air or if the prism is in any other medium, circles whose radii are the refractive indexes of the medium.

We shall define the angle θ_1 and θ_2 of the refracting surfaces as the angle which they make with a line at right angles to the ray entering the prism, that is, the optical axis. Evidently the normals to the surfaces will make similar angles angles to the optical axis AB.

Now the ray index point for the direct ray on the air circle must be on the optical axis line of our diagram on entering and leaving the prism as this point will determine the

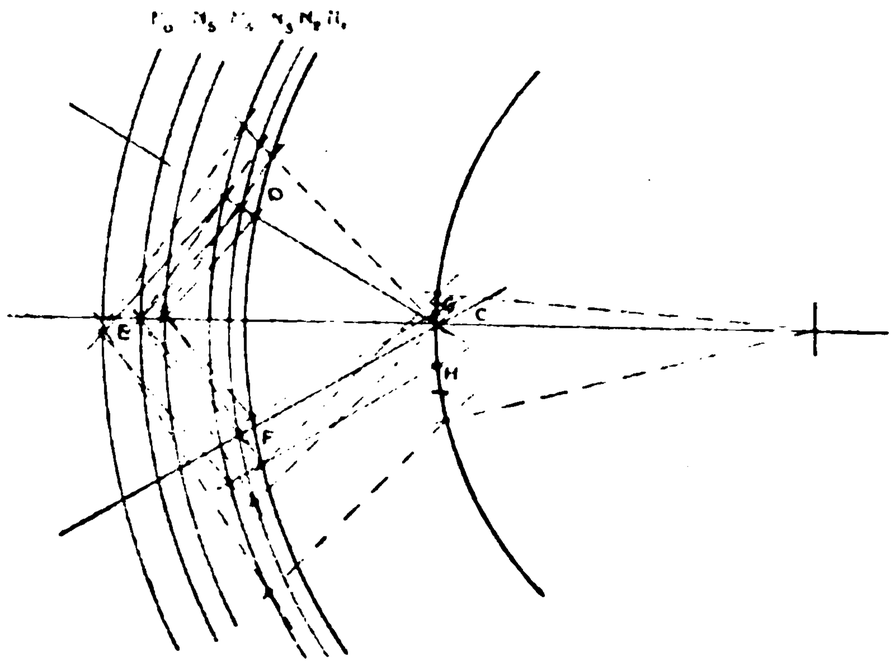


Fig. 5.

direction of the ray. Also as the prism is symmetrical the direct ray must be parallel to the optical axis on passing through the centre prism, so that its ray index point on the circle corresponding to its medium must also be on the optical axis. Therefore, we draw a line from the refracting point C of the direct ray in air at any selected angle θ, to the N_2 circle of the first medium (the cutting point D defining the ray index point in that medium) and then join a line from this point to the incident point E of the N_5 circle and the optical axis. The prism is symmetrical so we now draw a line at an angle θ_3 equal to θ_2 to locate the ray index point where the ray enters the third prism, and finally draw a line from F back to C the final ray index point. The lines CD, DE, EF and FC are, of course, surface normals, and the angles θ_1 θ_2 θ_3 and θ_4 the angles of our prism in accordance with our definition. Note that θ_1 is selected at will and that it is the only angle necessary to select* θ_2 and θ_3 following from the construction, and $\theta_1 = \theta_4$. We can see at once that so far as the direct ray is concerned the angle θ_1 and θ_4 may vary from 0 to a maximum when ED or EF become tangential to the N_2 circle (that is the critical angle at the second and third surfaces) we have, therefore, now to find a prism angle which will give the required dispersion.

Parallel to the surface normals, DE, EF and FG, we draw the surface normals corresponding to N_1 N_3 N_4 and N_6, fig. 5. The ray index points on the air line give the dispersion.

The dispersion found may be too high or too low, in either case we repeat the process, selecting a value for θ, which according to judgment will bring out the dispersion with an error in the opposite direction to what it was before.

Suppose the full lines, fig. 5, represent too low a dispersion, and the dotted lines the second trial, which is high. Let the points G and H be the dispersion required. We have only to give the new angle θ a value between its first and second value in roughly the same ratio as the distance of the correct dispersion point between the first and second dispersion points; to obtain what should now be final dispersion points which are exactly as required. In cases where θ has a very large value it is sometimes necessary to again correct the prism angles, as the dispersion is not sufficiently near being proportional to the difference between our first and second value for θ. However, this need not cause the student any alarm, as one can find the dispersion for half-a-dozen values of θ in less time than the process can be described, so that in but a few moments we know all the information about the prism which we require. The shape of the prism† can at once be seen by extending the lines CD and CF, as in fig. 4, the extension of these lines beyond the points D and F being the first and last surfaces respectively, and DE and EF being the second and third surface, we can, therefore, note as we proceed what the dimensions of the prism are likely to be for a given aperture, and if cumbersome, change our glasses or form of prism without loss of time. If we wish to draw the prism and trace the rays through it, it is best to commence with the first face drawn through the axis O as we can directly project the rays for the first refraction and have only to draw lines parallel to the direction indicated by the refraction points for the other surfaces. An

* This is in reference to a symmetrical prism, when this is not the case, other two angles must also be selected.

† Acknowledgment is here due to Mr. C. F. Smith, of Messrs. A. Hilger, Ltd., who first pointed out this interesting fact to me.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

actual example of a symmetrical prism is shown in fig. 6.

Prisms in which the angles are not symmetrical are treated in a similar manner; it should be remembered, however, that except in special cases (generally of very high dispersion) no advantage is to be gained by making the prism unsymmetrical, and the prisms tends to become more expensive to manufacture.

A case in which an unsymmetrical prism generally results, is when we desire to increase the dispersion for one part of the spectrum and to diminish it for some other. To do this advantage is taken of the fact that as the surface normals approach more nearly tangential to the refraction circles (*i.e.*, as the ray approaches the critical angle) the dispersion increases rapidly for a given change in angle; we, therefore, arrange our surface normals to meet the refraction circles corresponding to the part of the spectrum which it is desired to extend to approach as nearly tangential as is considered safe, and at the same time endeavour to make the surface normals for the other wave length meet their refraction circles as perpendicularly as possible. An example is shown in fig. 7 to which we will refer later.

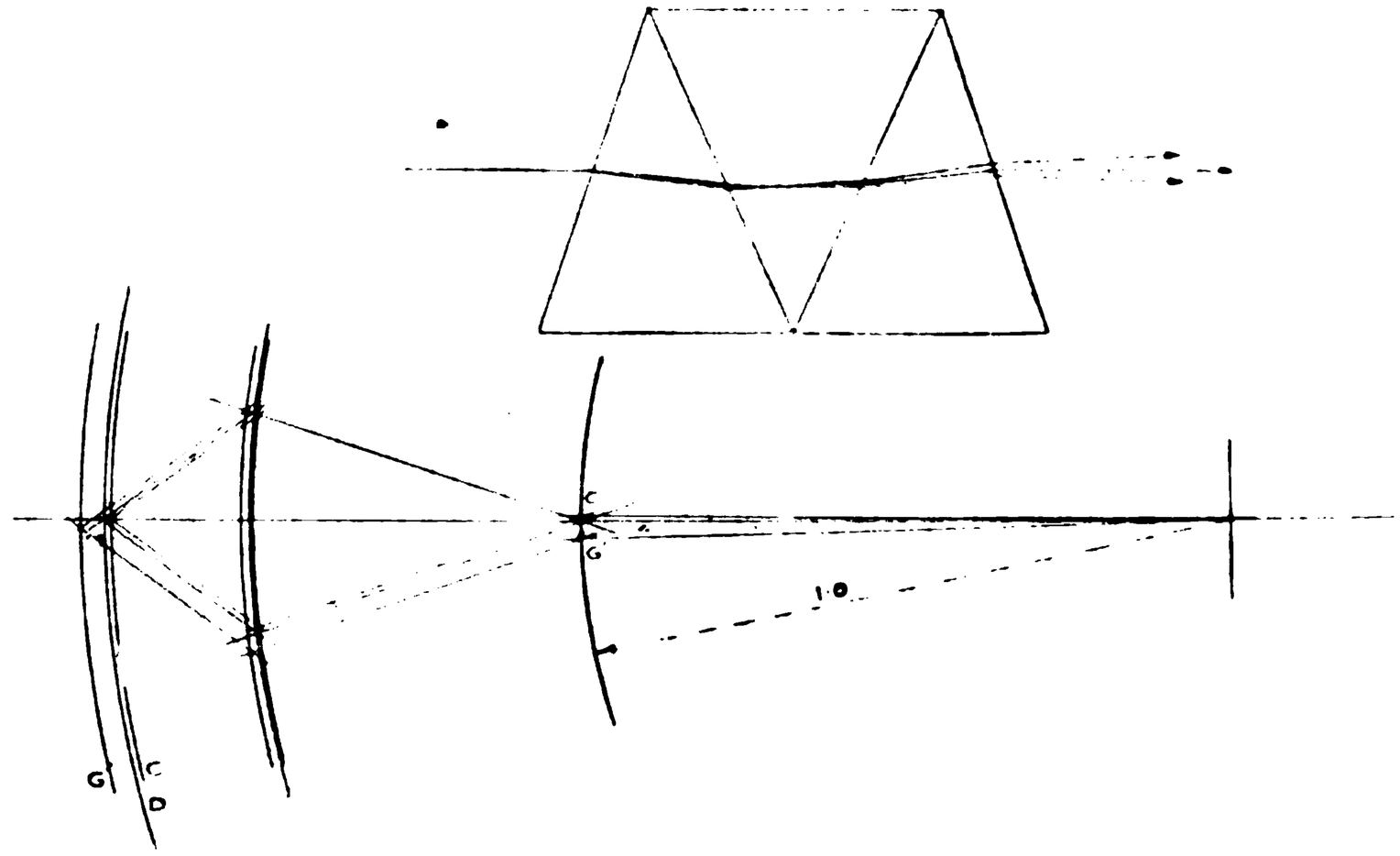


Fig. 6.

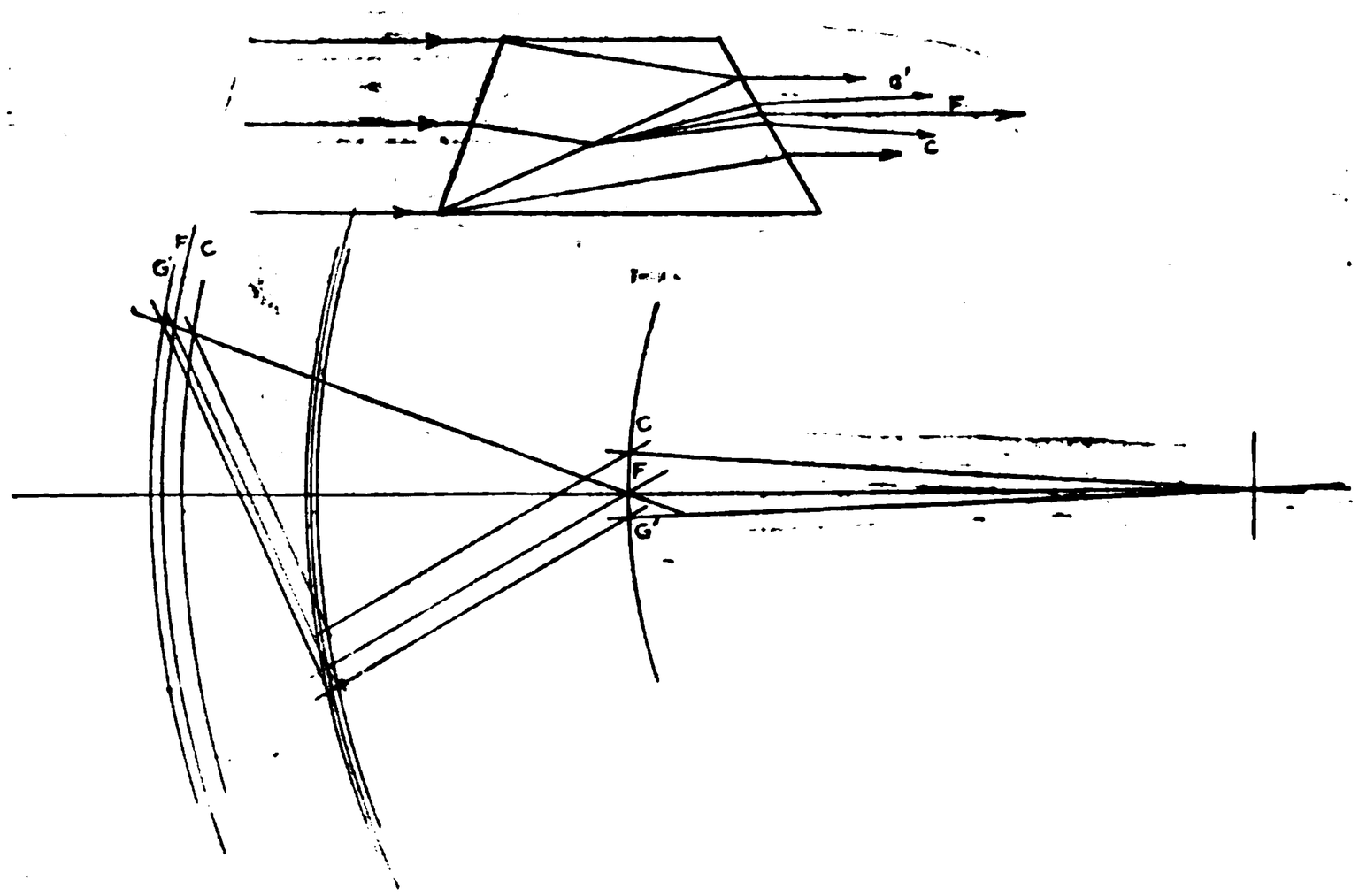


Fig. 7.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Seven Styles

now made in

"OCENTRIC" EYEGLASSES

BRITISH MADE.



A Distinctive Model for Each Individual Taste.

RIMLESS MOUNTS & FRAMES. G.F. & SOLID GOLD.

0	series	Short Plaquets Regular pattern
100	„	Normal Plaquets Regular Pattern
200	„	Long Plaquets Regular Pattern
300	„	For Centrally Drilled Lenses *(BENT UP PLAQUET ENDS.)*
400	„	For Centrally Drilled Lenses *(CLAMPS ATTACHED BY SHORT BRACKET.)*
700	„	For Centrally Drilled Lenses *(SWAN NECK BRACKETS.)*
800	„	Regular Pattern with Double Straps

SAMPLES and PRICES WILLINGLY ON APPLICATION.

The British Ocentric Optical Co., Ltd.,

Wholesale and Manufacturing Opticians,

12 & 13, EAGLE STREET, SOUTHAMPTON ROW,

LONDON, W.C. 1

Telegrams—Ocentricco, Westcent, London. *'Phone—Holborn 560*

Cables—Ocentricco, London.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

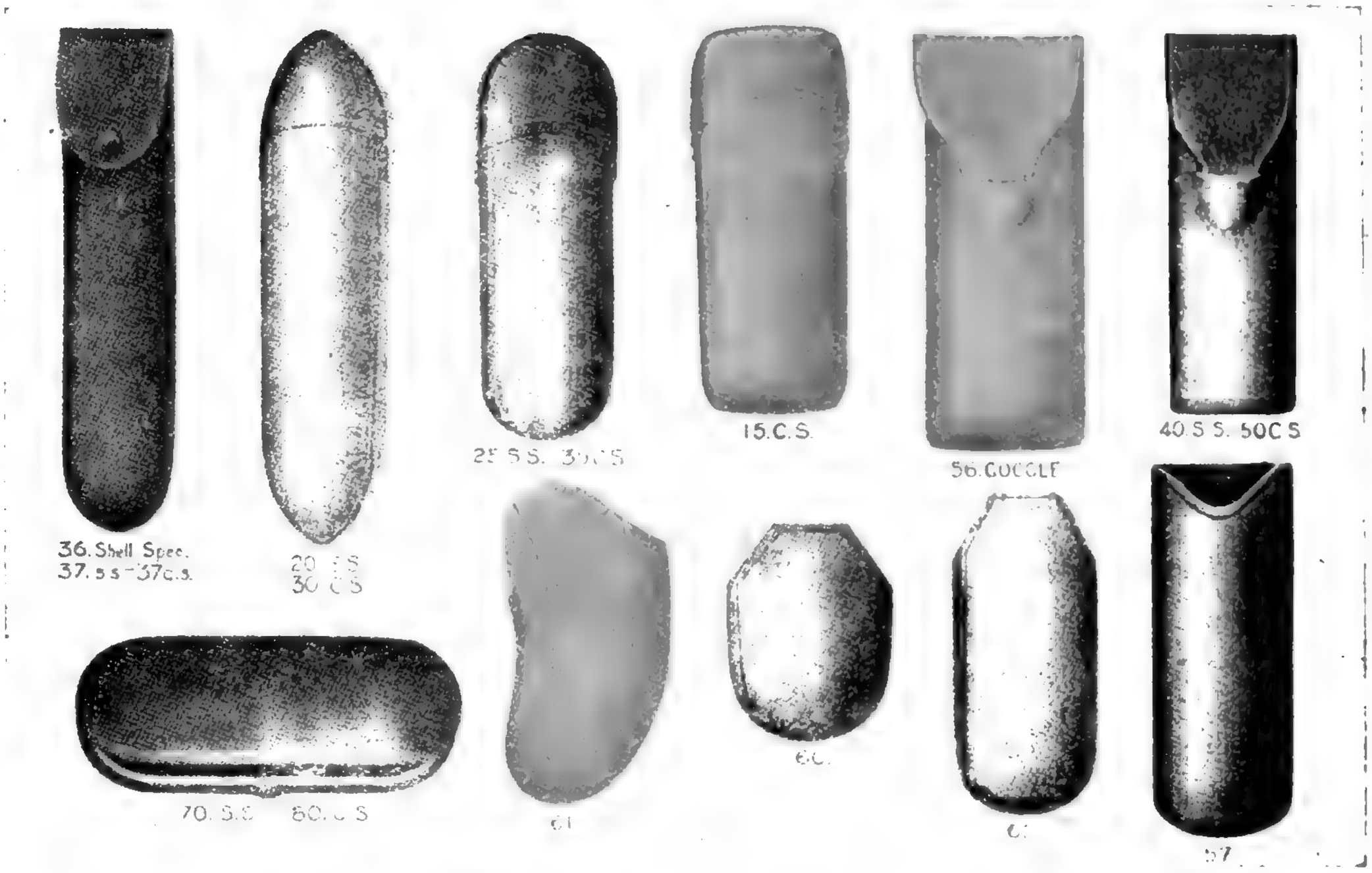
WHOLESALE TRADE ONLY.

W. Smythe & Co. Ltd.

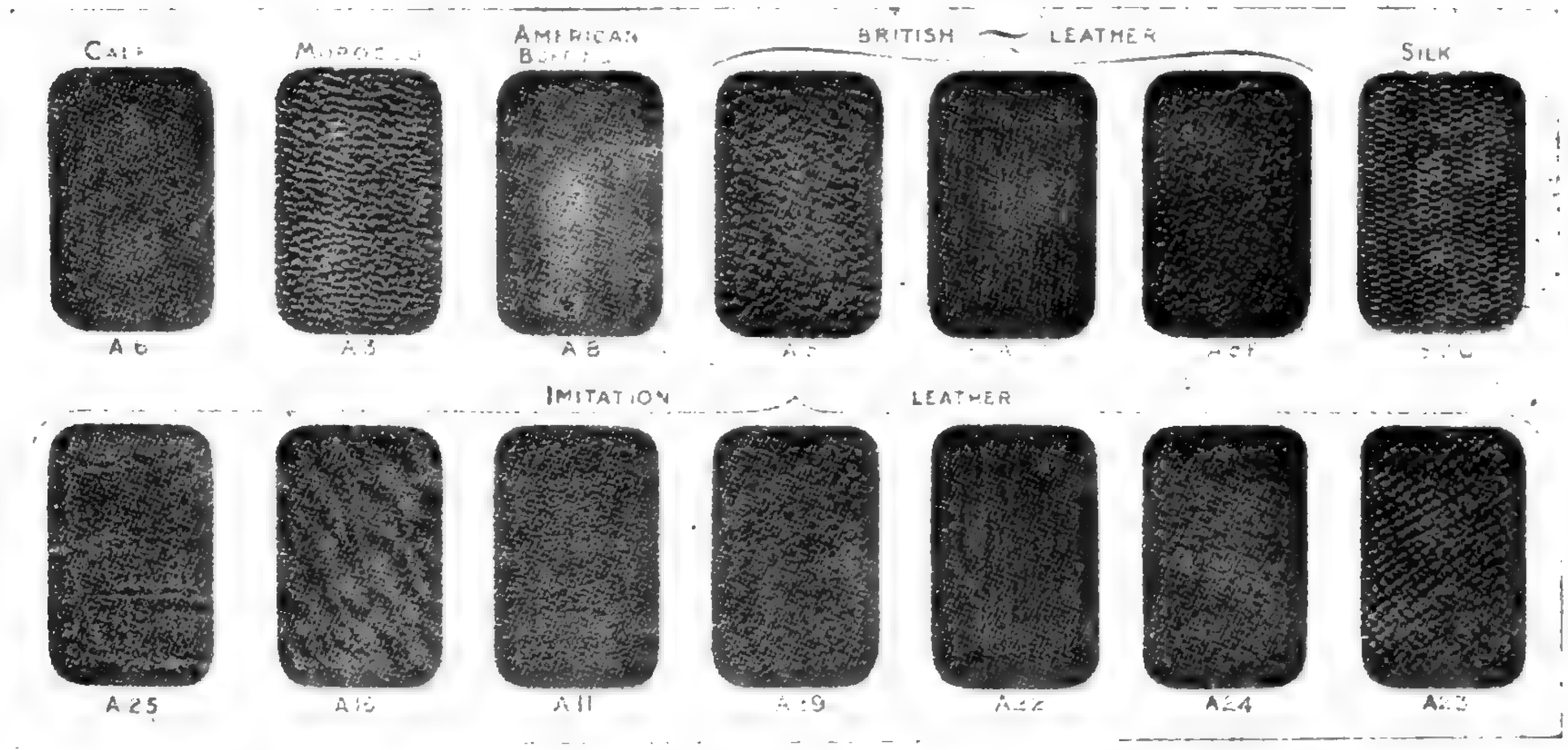
Head Office: 66 and 67, EDWARD ST. PARADE, **Birmingham**

Branch Works—HOCKLEY AND WALSALL.

Patent Optical Case Manufacturers



ALL OUR GOODS CAN BE COVERED WITH ESE MATERIALS AND VELVET.



ILLUSTRATIONS HALF-SIZE. COMPETITIVE PRICES

Also Makers of Patent Spring Lid Cases "NOWATE" Write for List and Prices.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

We must, however, beware of carrying unsymmetrical conditions to the extreme, as unsymmetrical transmission of the rays through a prism involve an alteration in the size of the aperture. This is very forcibly shown in the case of a compound prism composed of two elements only as shown in fig.

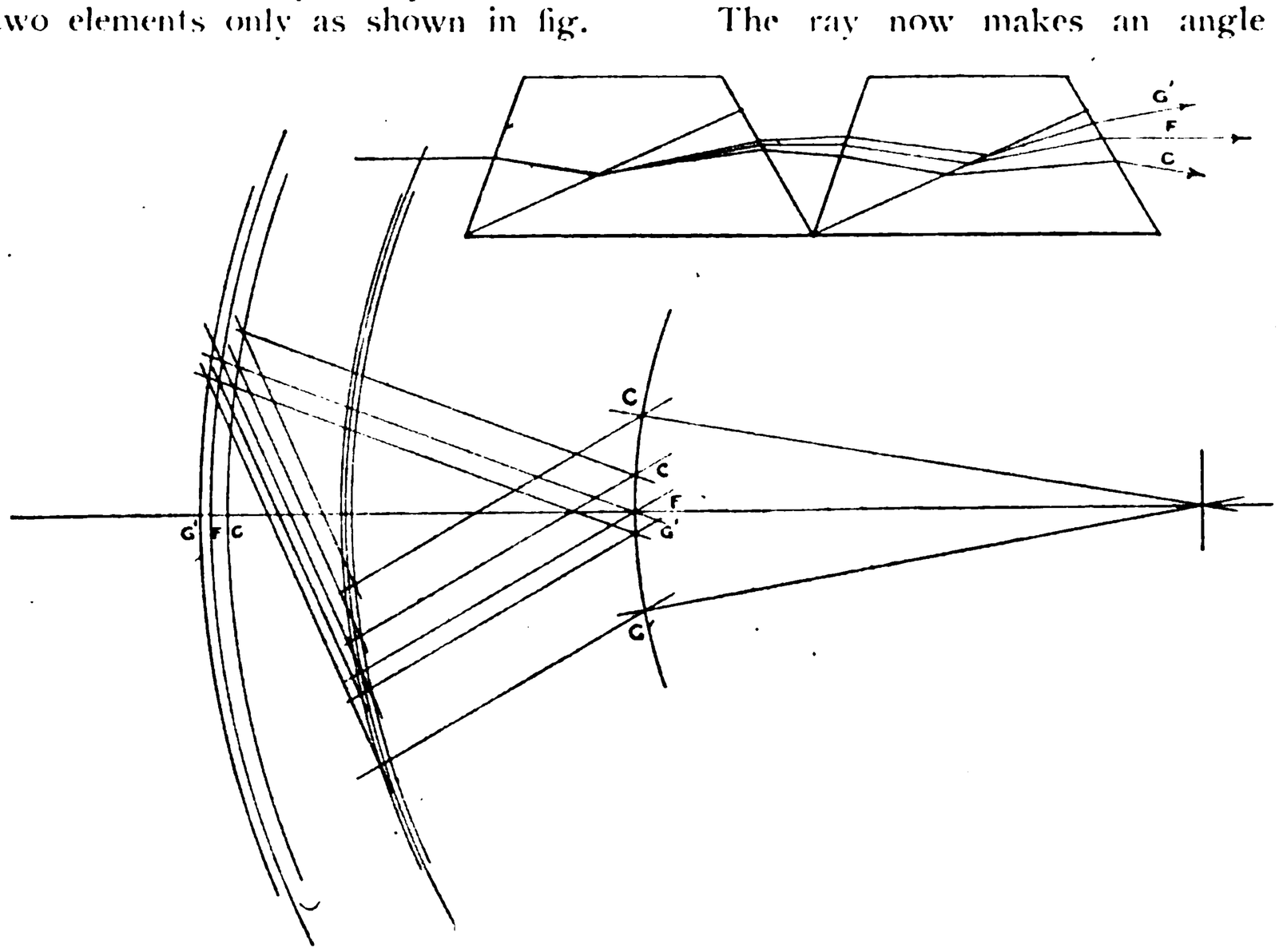


Fig. 8.

7. High dispersion can easily be obtained from such a prism, but the reduction in aperture is also considerable. In the simple case of a spectroscope in which the light is collimated by a lens and then viewed by the eye, such a prism is quite satisfactory. The prism shown in fig. 8 is one of a pair designed to work together. It is a very interesting example of a prism system in which the dispression between C and F is made equal to that between F and G', the system being direct for F.

Note that after transmission through the first prism, the dispersion C-F is about twice that from F-G', and yet after transmission through the second prism (which is similar to the first) the dispersion comes out exactly as required).

Having found prism angles for any given case, it might perhaps be useful to indicate how the result can be rapidly checked by calculation when this is deemed necessary.

We commence, of course, with our direct ray, and if our prism is symmetrical we need only trace through one half of the prisms. We may accept the diagram value of θ or ϕ to check the other. Let us select θ, fig. 9, for example. Calculate value of

$$r_1 = \sin^{-1} \frac{\sin \theta}{N_1}$$

The ray now makes an angle with the optical axis $\delta = \theta - r_1$, and the problem is to find a value for ϕ which will make the ray after refraction at the second surface parallel to the optical axis. In this case $i_2 = \delta + r_2$ or, as $r_2 = \phi$ $i_2 = \delta + \phi$ so that

$$\phi = \tan^{-1} \frac{\sin \delta}{\frac{N_2}{N_1} - \cos \delta}$$

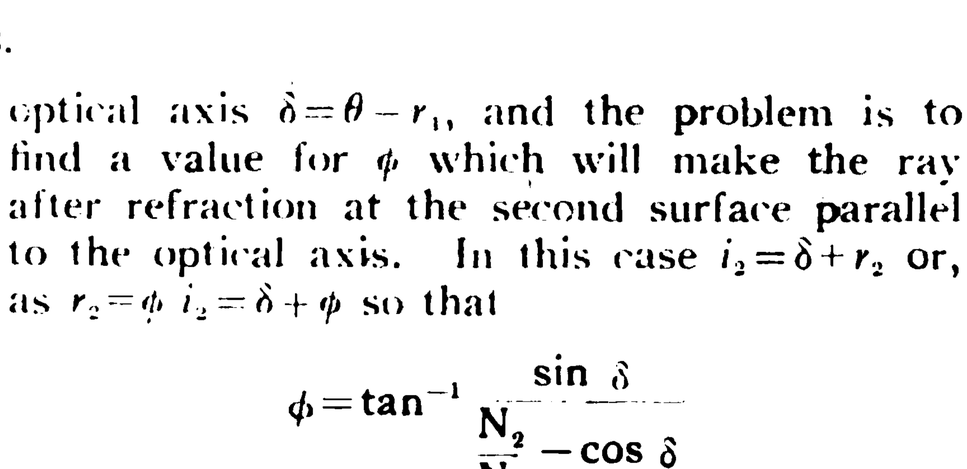


Fig. 9.

Had we selected a value for ϕ we should probably have found that $\theta = l_1$, $r_1 = \theta - \delta$ in which case,

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

$$\theta = \tan^{-1} \frac{\sin \delta}{\cos \delta - \frac{1}{N_1}}$$

If we also desire to check the dispersion, the rays for λ_1 and λ_2 are now traced through. A useful formula to remember at this stage is, that if a ray, fig. 10, passes from one surface to another, the surface angles of which are

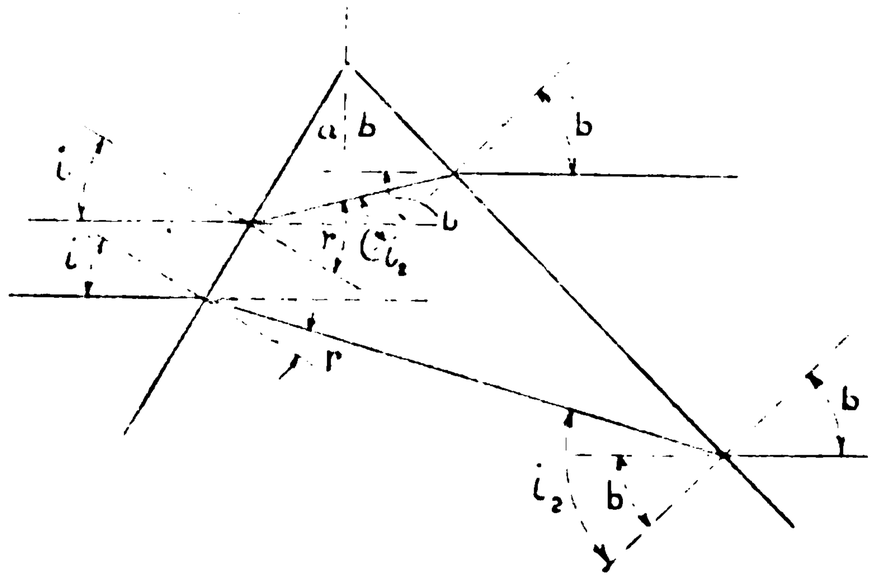


Fig. 10

a and b, the refracting angle at the first surface being r, and the incident angle on the second being i_2

$$i_2 = a + b - r$$

We will now turn our attention to another type of diagram suitable for cases in which the dispersion is very small—say 30 minutes or less. This is a modification of the above method to meet a special case, and is included quite as much to show how graphical methods can be modified to meet a special case (when the number of problems to be solved justify the time spent on working out the special method).

An inspection of our standard method will show that if the dispersion is very small, say less than 30′ it will not be easy to determine on account of the surface normals being very close together, their distance apart being in fact about the probable error with which the diagram can be drawn. However, as the prism angles will in general be small, the surface normals will make but a small angle to the optical axis; we may, therefore, replace our refraction circles by straight lines perpendicular to the optical axis. We may now only consider the angular relation of our surface normals to the *refraction lines* (as we shall now call our refraction circles). Evidently the distance between the air line and the refraction lines, and the distance between one set of refraction lines and another set is of now no account, and all three may be combined and drawn to a very highly magnified scale. All distances to the refraction lines are now measured with reference to the direct ray point on the air line; the distances are in fact what is described on glass specifications as "partial

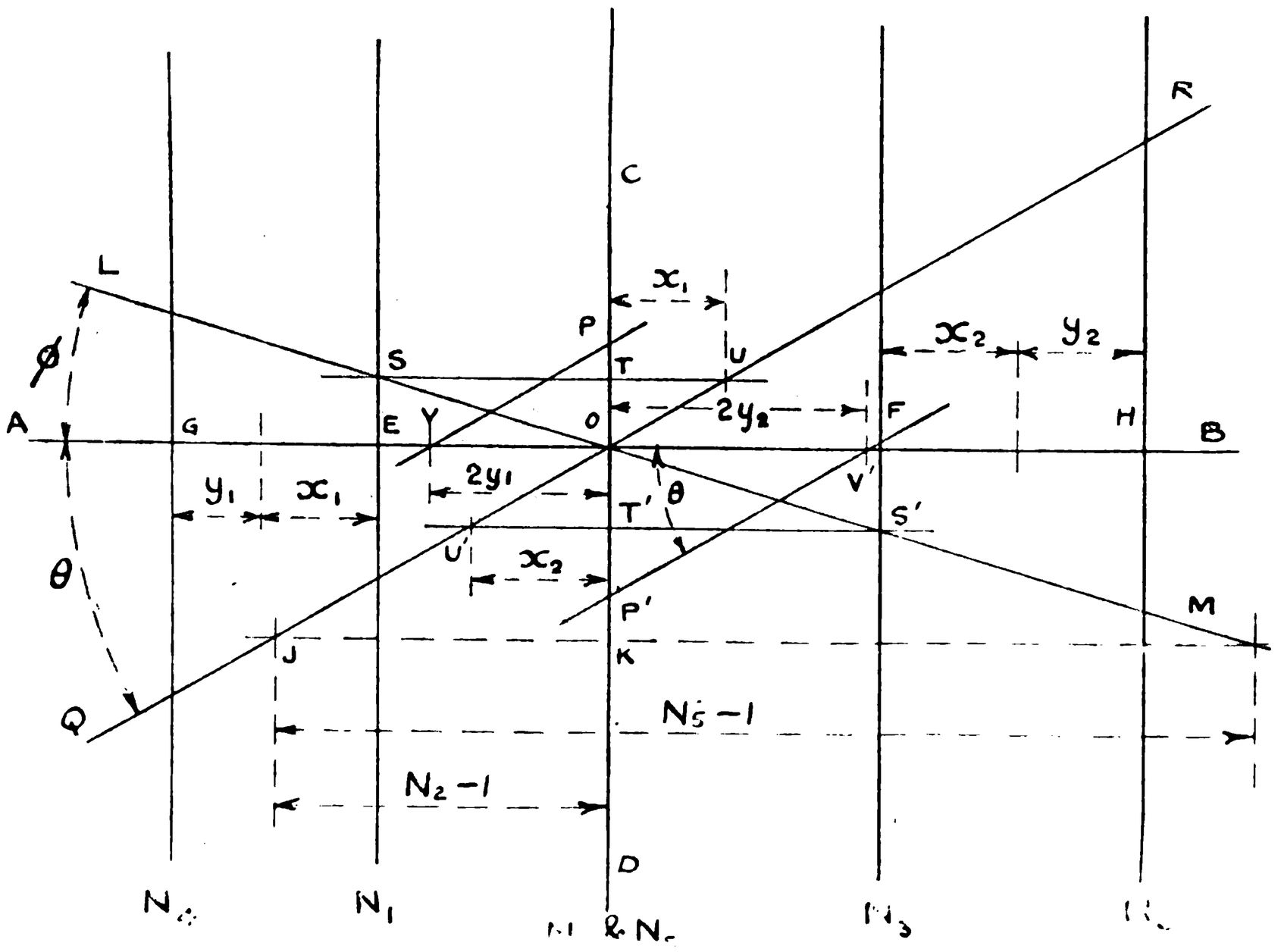


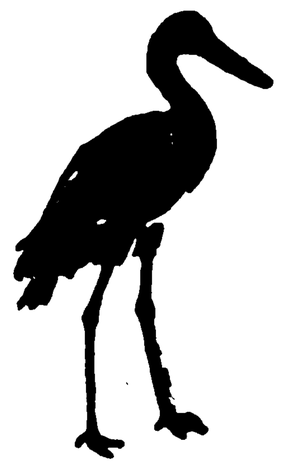
Fig. 11.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Are you looking for a Really Reliable Automatic Eyeglass Holder

If so—send for samples and particulars of

The "Stork"



BRITISH MADE.

Automatic E.G. Holder

PAT. APPD. FOR

The Chain with the locking bolt action
.. which cannot accidentally recoil. ..

New in Principle. Reliable in Action. Reasonable in Price.

All details from:

WALTER H. THOMPSON,

: 66, HATTON GARDEN, E.C. 1 :

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713 (Two Lines).

Digitized by Google Original from THE OHIO STATE UNIVERSITY

OPTICAL MANUFACTURERS LTD.,

(Incorporating Wheway Optical Co., Ltd.)

WAR TIME CONTRACTORS TO THE ARMY SPECTACLE DEPOT.

THINK OF THE MONEY YOU LOSE every year (and the dissatisfaction given) owing to your customers bringing back Rimless Spects or Eyeglasses complaining that Lenses have worked loose.

This Trouble and Expense can be entirely avoided by using

The New Patent Tied Straps.

Any wholesaler will supply you with Finger Piece or Rimless Spect. Mtgs. fitted with above.

Works at VYSE STREET and GEM BUILDINGS, HOCKLEY HILL, BIRMINGHAM.

London Office: 55, HATTON GARDEN, E.C.1.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

dispersion."

The procedure is as follows:—

Draw a line AB, fig. 11, and at right angles to it a line CD. To any large scale make the distance $EO = N_2 - N_1$ and distance $OF = N_3 - N_2$. To the same scale make $GO = N_4 - N_1$ and $OH = N_5 - N_2$. Draw vertical lines through all the points. To any other (smaller) convenient scale draw other two perpendicular lines such that $JM = N_5 - 1$ and $JK = N_2 - 1$. Let us now select by judgment a value for the angle θ of the first and last surface and draw a line QR at this angle through the point O. Where QR cuts the perpendicular J draw a line parallel to AB, where it cuts the perpendicular M draw a line LM through the point O, the angle BOM is the prism angle ϕ of the second and third surfaces, the prism being assumed symmetrical. Through the point S where LM cuts the N_1 line draw a line parallel to AB. Let T be the point where the line cuts the N_2 N_5 line, and U the point where it cuts QOR. Let distance TU = X. From the point E on the N_1 line measure off a distance = X in a direction away from point O. Measure off a distance $Y = GE - X$ and from the point O measure off a distance = 2Y. Repeat the whole of this process for the N_3 line, starting from point S'. Call the points found V and V' respectively. Now if we draw lines from the points V and V' at any selected angle, the distance P P' is the linear dispersion for a base length = 1, to the same scale as the N lines, that is, the tangent of the angular dispersion required. We commence by drawing the lines VP and V'P' at the angle θ, that is parallel to QR. The dispersion will probably be high or low, but it is easy to see that by comparing the dispersion obtained with what is required we can, with very little measuring, assign a value for θ which will give the dispersion required. Having found a satisfactory value for θ the corresponding value for ϕ is found by drawing a line through the new point J parallel to AB as before, to obtain the corresponding point M ϕ being equal to BOM.

At first sight this process may perhaps seem a most ghastly performance, but when once understood this is by no means the case, one can get out the desired angles for a given dispersion in less than five minutes after drawing the N lines, and with an accuracy of about 2 per cent.

In conclusion it may be pointed out that by means of the first described diagram, one can study the possibility and limitations of any prism system whatever, with an ease and speed not possible by calculation, inasmuch as we actually *see* the result and the possible modifications, whereas by calculation they can only be dimly conceived by imagination.

In conclusion acknowledgement is due to Messrs. Adam Hilger, Ltd., who kindly consented to the publication of the prisms shown in figs. 7, 8 and 9, which are actual examples of prisms designed by this method.

The National Association of Opticians.

A meeting of the Council of the N.A.O. was held at the Royal Technical College, Glasgow, on the 9th inst. There were present Messrs. A. Hershberg, R. Chalmers, J. W. S. Green, J. W. Oberle, L. Moreton Parry, D. R. Jones, T. S. Baird, C. Adams, and E. Moevius. The President, Mr A. Hershberg, presided. The minutes of the meeting held on July 13th, were read and confirmed; and letters of apology from Messrs. H. W. Daykin and T. Beardsall for inability to attend, were read.

Among the correspondence—which was then dealt with—were letters from members in different parts of the country, containing expressions of approval of the Council's recommendations to the members assembled at the Annual Meeting, that the N.A.O. shall hold examinations for sight-testing opticians, and provide instruction for same.

Considerable discussion took place regarding the circular issued to examination qualified members of the ophthalmic profession, by the National Insurance Beneficent Society; but no decision of general interest to the profession at large, was arrived at.

After the accounts for the month had been passed for payment, the applications for membership were duly considered, and of them, the following were elected:—Miss H. A. E. Grant, Craigview, Granton-on-Spey, Scotland; Mr. W. A. Brown, c/o Mr. H. A. Gibbs, Upper Hut, Wellington, New Zealand, and Mr. J. S. Russell, 15, Castle Street, Paisley Scotland.

At the adjourned meeting of the Council, the retiring officers were unanimously re-elected.

The Overseas Department of the Board of Trade comments favourably on the commercial prospects for British firms participating in the Brazilian International Exhibition, which will be held next year at Rio de Janeiro, to celebrate the Centenary of the Independence of Brazil.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

QUALITY FIRST

THERE IS NOTHING BETTER THAN

D. Y O. Co.'s

1921 Model Finger Piece Mounting

Guaranteed 1/10th-12ct.

Style and finish perfect in every respect.

Ask for, and insist on getting

DUPAUL, YOUNG OPTICAL

Co.'s Spectacleware.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. Telephone: CENTRAL 7241

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"BISHOP QUALITY"

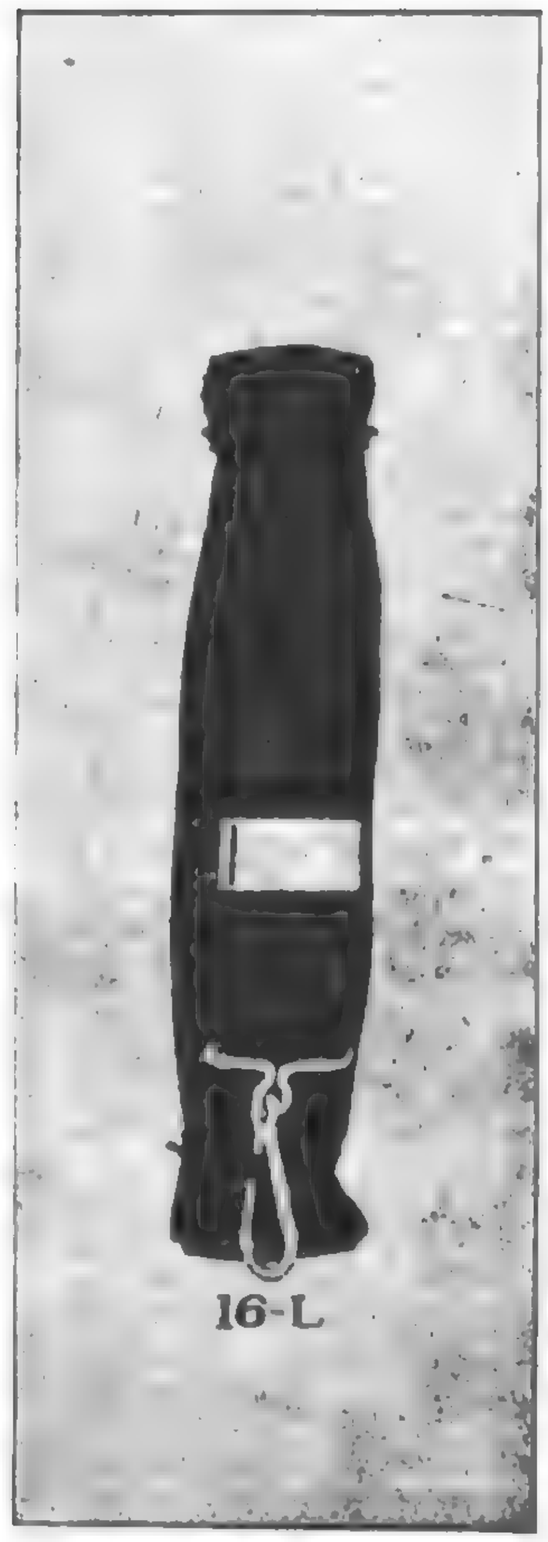


14-L

SILK EYEGLASS CORDS AND MONOCLE RIBBONS.

With Gold Filled, Silver or Gun Metal snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.



16-L

THE BISHOP COMPANY,
North Attleboro, Mass., U.S.A.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

The Optical Key Industry.

As is natural, the passing of the Safeguarding of Industries Bill has caused copsiderable perturbation among the Free Trade correspondents of our political contemporaries; and readers of *The Optician and Scientific Instrument Maker* who are Free Traders may be interested in the following excerpts from letters printed in the 'Manchester Guardian':- Mr. W. A. Caspari writes:—

"It is desirable that the case for free importation of laboratory requisites should be stated in its full and just scope. The interests of educational laboratories, are small compared with those of the industrial laboratories of this country, which are threatened with precisely the same handicap. The research laboratory nowadays finds a place in the majority of our larger manufacturing concerns, and is doing far better work than the professoriate or the public realise. Nor is the supply of industrial chemists dependent upon educational laboratories; it is largely met, and is likely to be increasingly met, by way of apprenticeship. The matter, in fact, concerns our manufactures in a very direct and not merely in an ultimate sense. Teachers of science have a real grievance, and are entitled to plead their own cause; but they must not raise false issues.

"The fair thing, and the wise thing, would surely be to delete the discrimination against imported laboratory requisites altogether. If the suggestion of your correspondents and your leading article were followed, we should be opposing an unjust monopoly of certain inefficient British manufactures by an equally unjust monopoly of certain laboratories. Such an attitude would not strengthen our case. Moreover, the example of Canada and South Africa is hardly to the point. In those industrially juvenile countries educational laboratories may perhaps be more important than the comparatively few industrial laboratories. In Great Britain the converse—very much the converse—holds good."

On the other hand, Messrs. Bellingham & Stanley, Ltd., write, referring to a statement that the polariscope, an instrument of great value which is now widely used, has never been procurable here.

"May we be allowed to say that we have regularly advertised our British-made polariscopes since 1915? The whole of the polarmetric work carried out at the National Physical Laboratory is done with an outfit of our manufacture. Similar outfits have been supplied to many large industrial concerns and to universities, technical colleges, and other centres of learning. Further, we have been able, with the co-operation of the National Physical Laboratory, to supply the specialised polariscope used in the sugar industry in such a form that an accuracy six times greater than that ordinarily obtainable in German instruments is guaranteed. The companion instrument to the polariscope the refractometer - is also made by us, and is admittedly superior in design and convenience to any refractometer of German manufacture. Polariscopes and refractometers of our make are actually in use in Manchester, Liverpool, and other cities at the present time, and have been shown at the British Science Guild and other exhibitions, and also at the Royal Society."

The following excerpts are from a contribution by Mr. Austin Hopkinson, M.P.:—

"The majority of the Conservative members now recognise that the cry for Protection is the cry of the pauper, of the proletariat, of those who wish to take from the community more than they give. They are disgusted with the deception which has been practised upon them, but believe themselves to be bound by certain election pledges. They perceive at length that protection is a policy which can be pursued honestly only by the Labour party, since it is a natural and inevitable out-growth from Socialism.

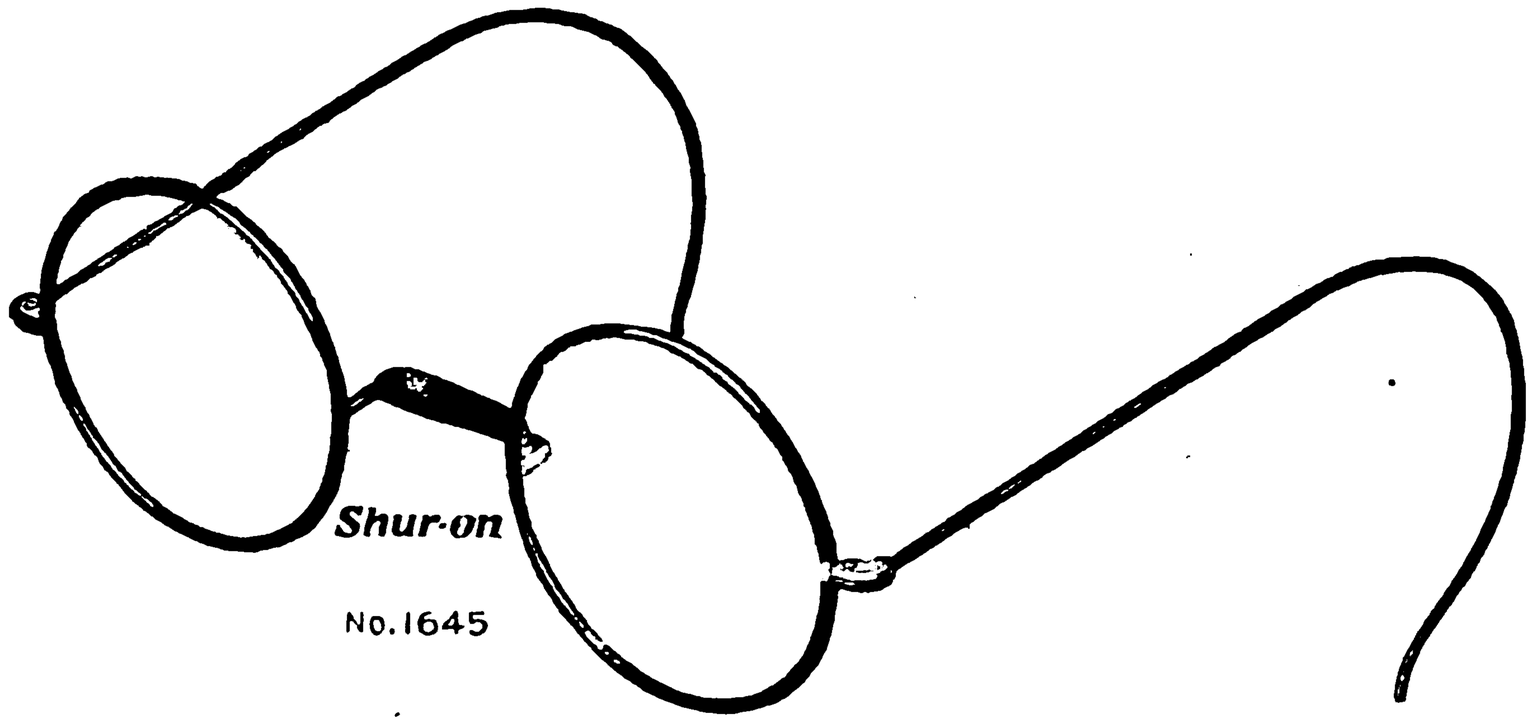
"The provisions of the egregious measure have been discussed *ad nauseam*, but in all probability the Bill would have been killed had not the tactics of the official Opposition been so injudicious. More than once opportunities for destroying it have been given (or at least have occurred). But on each occasion the opportunities have been lost and the Bill survives. The advocates of Protection are not very quick at seeing a point, so the Bill might easily have been killed before their eyes without their realising what was happening. But it has always been saved by that *cacoethes loquendi* which is endemic on the Independent Liberal and Labour benches. We poor Conservative Free-traders sit in an agony of suspense watching the gradual dawn of intelligence on the faces of the Tariff Reformers as the official opponents of the bill, such as Mr. Barnes and Sir. D. Maclean, saved its confounded life again and again by long-drawn facetiousness."

Mr. A. Hopkinson's incisive comments on the matter in Parliament were reported in our issue of July 29th.

Pressure on our space has necessitated holding over some articles and correspondence in type.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Shur-on Glasses



Here's The Frame Your Patrons Have Been Asking For—

It's a Shur-on—practically all Shelltex! Still, a lightweight—dainty and neat! And metal lined throughout—for rigidity and strength; With all tubetex temples. *And a Shelltex covered bridge*—for easy adjustability—for supreme comfort to sensitive noses—for smart style! In short, it's just what your patrons have long wanted. Adapts itself readily to slender features. It balances the face.

If your wholesaler can't supply you write us direct.

SHUR-ON OPTICAL Co.,

Rochester, N.Y., U.S.A.

Quality Beyond Question Since 1864

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Our Service is Visionary— but it produces Solid Results.

IT is a matter of great importance to you that the glasses you hand to your client are really the tangible result of your skill.

Unless you can be sure of this, the time and trouble you have occupied in making tests will be wasted and your client will not find the benefit he anticipates.

Such a state of things is disappointing to your client and damaging to your own prestige.

Regrettable incidents of the kind mentioned will never happen if you send your Rx work to the **L.O.C.**

And remember—**L.O.C.** means lowest of charges—quality of work considered.

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere Paris. France.

Also at—2, Str-Barsei, Bucharest, Roumania.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Routine of Subjective Sight Testing.*

By LIONEL LAURANCE.

A Lecture before the American Optometric Association's Convention, New York.

We should particularly avoid excessive fogging for the reason that a cylindrical selected under the condition existing, would not have the same effect, for correcting astigmatism, when the spherical is altered. The ideal would be not to have to change the spherical, after selecting the cylindrical but this, in practice, not being possible, we aim to make the change small, that is only about .5D.

Then if the eye is generally hyperopic the fogging lens should be about .5D. stronger than the strongest + sph. that gives best vision. When the vision is good, that is 6/6 or better, it will, by this procedure, be fogged to 6/9. If the eye is generally myopic, the spherical lens needed so that the astigmatism may be corrected should be just strong enough to make clearly visible one of the astigmatic fan lines. If the astigmatism is of high degree the best vision obtainable with a spherical will remain bad.

The condition of astigmatism is such that light diverging from a point, and entering the eye, is brought to a focus in two lines at different distances and at right angles to each other, and each is at right angles to the meridian of which it is the focus.

When the eye is myopic, actually or artificially, one of these lines must be nearer the retina than the other, and at the retina the image of an object point is a linear or elliptical confusion disc.

If an astigmatic fan be viewed by an astigmatic eye the retinal image, although inverted is similar to the object seen—that is a fan of radiating lines, but some one of these various radiating lines must correspond more or less precisely in direction with the retinal confusion discs. This line is seen clearly, it being indistinct merely at its extremities. The line, at right angles to it, is the most blurred, the retinal confusion discs being at right angles to the edges of its image. Then the presence of astigmatism is determined if lines running in one direction are seen more clearly than others and for this purpose nothing is better than a fan whose lines are of proper dimensions. In the one I use, the black lines are of the same dimensions as the limbs of the No. 36 types and the white lines are the same as the limbs of the No. 9 type.

The clearest and the dullest fan lines give also the two principal meridians of the eye, and the axis of the correcting cylindrical, whether Cx or Cc., lies in the meridian corresponding to that of the dull fan line or at right angles to that seen blackest or most sharply.

If several lines are clearly seen, the one principal meridian is marked by the centre of the group, but if the group is large it shows that the eye is insufficiently fogged and this should be remedied. Under the condition previously mentioned two or three lines only should be seen really black.

In a radiating fan we have, however, the difficulty of not being able to locate the principal meridians precisely. For this purpose something more exact is needed and it is found in a revolving chart consisting of series of fine white lines, on a black ground, which run in two directions only at right angles to each other. With this and a scale graduated to 5° intervals, the principal meridians can be determined to a very high degree of exactitude.

The radial lines of this chart are placed in the meridian, indicated by the blackest line of the fan and revolved 5°, to the one and other side, until the meridian is located in which they are most sharply defined—this will be when they correspond exactly in direction to the retinal confusion discs. Some little time should be spent on determining the principal meridians and, once determined, no further attention should be given to this point. The numerical notation on the chart scale shown is reversed through 90°, so that the direction of the clearly defined lines indicates the angular position of the axis of the correcting cylinder in a trial frame scaled to standard notation.

Rotation of the cylinder in the trial frame should be unnecessary if the principal meridians are determined in the manner suggested.

The tangential lines of the chart being blurred, the test consists of finding that concave cylindrical which will make them black and clear equally to the radial ones. A cylindrical which is too weak will leave the original clear ones still the clearer, one that is too strong will cause the tangential lines to be clearer than the radial. Very frequently two or three different cylindricals will cause equality, the strongest of these is the one re-

*Continued from page 381.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

quired. The power of the cylinder should always be increased until this reversal takes place and that cylindrical, immediately preceeding the one that causes reversal, is the measure of the astigmatism.

Cause of Reversal.

The reason of the reversal is this. The ocular focal line corresponding to the radial chart lines lies in the eye, nearer to the retina but slightly in advance of it, the other ocular line, corresponding to the tangential lines lies further in front of the retina, in the vitreous. The proper cylindrical recedes the front focal line to the plane of the second when point foci of object points are formed and the astigmatism is corrected. If the cylindrical employed is too strong it carries the original first focal line beyond the other, and so nearer to the retina when, in consequence, the original blurred chart lines become the clearer and we know that the astigatism is overcorrected.

If one cylindrical leaves the radial lines the clearer, and the next stronger one reverses this condition, the weaker one should rather be selected—as a rule. We must not forget, however, that frequently some astigmatism remains masked or latent but, even if this does occur, it is just as well—generally—to leave fuller correction to a later date.

In all ordinary cases once the astigmatism has been determined—as to the principal meridians and degree—these need not be further considered during the other stages of the test. The exceptions, as in high anisometropia, and where large changes of sphericals have to be made, as in high myopia or complete presbyopia with considerable astigmatism, come under the heading of exceptional cases.

It is as well, while testing the astigmatism, to keep under observation the acuteness of vision as indicated by the types. Each increase of cylindrical power should improve vision. This is advisable because a cylindrical which is considerably too strong would, by carrying the originally front focal line far behind the other, still leave the originally clear lines clearer than the others, and not show the reversal mentioned.

It may be here remarked that corneal astigmatism, as measured by the ophthalmometer, is not that of the eye, nor the same as the needed cylindrical.

After the cylindrical has been selected the spherical has to be found. The spherical that is in front of the eye being too strong a Cx. or too weak a Cc. its power must be altered by the addition of a weak Cc. spherical, say, .25 or .50D. and gradually quarter diopter by quarter diopter, changing the spherical each time, until any further addition of .25D. Sph. to that in the frame causes no further improvement in the visual acuity.

We thus find, by exclusion, firstly that cylindrical which brings the two focal lines of the eye into the same plane and thus corrects the astigmatism and, secondly, that strongest possible Cx. Sph. or weakest possible Cc. Sph. that gives the highest possible vision acuity. Any stronger Cx. makes the sight worse and any stronger Cc. does not improve it. So far as it is humanly possible—with the arbitrary series of lens powers found in a trial case—we have determined the measure of the manifest monocular optical defect.

If there should be no astigmatism, of course, the spherical only has to be found.

The chief cause of all—by far—of finding lenses that do not suit the main cause of erroneous tests—is the attempt to find the spherical needed before the cylindrical. This is frequently the cause also of so-called spasm of accommodation which is not spasm of accommodation at all, but the condition arising from wearing lenses not suitable for the eyes.

Only when there is no accommodation, is it possible to find the spherical before the cylindrical, and then the test is generally made

THE MARK OF
QUALITY AND RELIABILITY

ELLIOTT'S
Revised
Rx Price List

on application to

Elliott Optical Co.,
104 & 105 GT. SAFFRON HILL,
LONDON, E.C.1

Elliott's Rx Service is What You are Looking for.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

ARE YOU PUSHING

Chance's A2 Crookes?

We are. It is increasing our sales and bringing new customers.

Let us send *you* samples.

Show it to *your* clients.

Increase *your* sales.

Send for the W.O.W. price list.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY:
DUDDEN HILL LANE, N.W.10

THE
GLASSIE
LENS CLEANER

Your Name and Speciality printed here. The "Glassie" becomes your invaluable business bringer.

Your Silent Salesman!

It is conveniently carried in the spectacle case, therefore is always in front of the people in whom you are most interested.

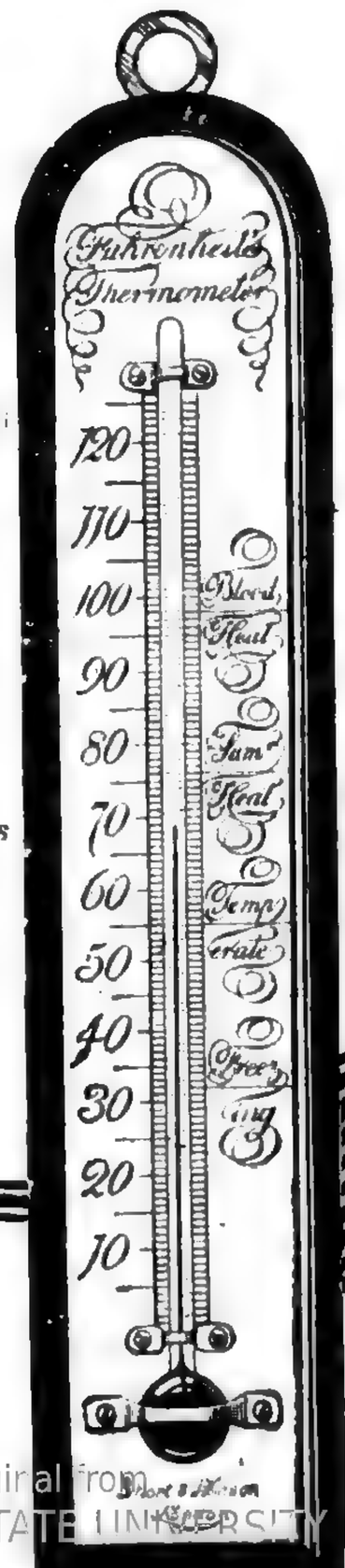
A constant reminder of you.

Can be obtained from your Jobber or direct from

THE GLASSIE LENS CLEANER Co
156 CHARING CROSS ROAD. LONDON. W.C.2.

A
Thermometer
of
Character

Reproduction of an Antique design, Plain red spirit tube, lacquered brass scale on period finish Oak mount.



SHORT & MASON LTD.,
Scientific Instrument Makers,
Aneroid Works,
WALTHAMSTOW,
LONDON, E.17

Write for particulars and general booklet.

No. 3710 (half size).

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

FOUND

AT 36, GRAY'S INN ROAD, LONDON, W.C. 1, A HOUSE THAT CAN GIVE YOU AN

EXCELLENT **RX** SERVICE

Combined with

SPEED, ACCURACY & INDIVIDUAL ATTENTION.

If you are looking for a house of this description, send a few trial orders and be

REWARDED

KIRK BROTHERS

WHOLESALE & MANUFACTURING OPTICIANS

36, GRAY'S INN ROAD, LONDON, W.C.1

Telephone: HOLBORN 1620 (Private Exchange). Telegrams: KIRBROREX, KOLB. LONDON.

Price List and Prescription Book on Application.

Rx

SANDRO LOWY

Optical Rx Specialist,

88, Goswell Road,

LONDON, E.C. 1

Telephone: CITY 304 (two lines)

Telegrams: SANOPTIC LOZDON.

Rx

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

more difficult and there is a greater likelihood of going wrong.

The procedure of a subjective test in an ordinary case, is as follows:—

(1) Take the binocular vision.

Occlude the left eye and note the vision of the right.

Occlude the right eye and note the vision of the left.

Record these.

(2) Test the right eye first as a matter of routine, although some prefer to deal with the worse eye first, if there is a marked difference in the vision of the two.

Put on trial frame and occlude the left eye.

(3) Determine the presence of manifest hyperopia, or its absence, by a + Sph. being accepted, or the weakest being rejected. If there is hyperopia find the strongest + Sph. accepted and then fog by increasing its power.

(4) Determine the presence or absence of astigmatism.

If present determine the principal meridians and correct the astigmatism.

(5) Complete the measure of the hyperopia by reducing the power of the lens used for fogging.

(6) The right eye being measured, repeat the test for the left.

(7) Note whether the eyes are equalised. this is a most important part of the complete test.

The Equalisation Test.

It can be done by placing an occluder before each eye, alternately, and getting the subject to notice how fine a type he can read on the chart with each eye. The visual acuity will be equal, if the two eyes are equalised, and not otherwise. The very essential part of this test is to expose alternately each eye just long enough for the light to be received by the eye. the sensation conveyed to the brain and mentally interpreted, and not so long that the accommodation can be readjusted. One second is about the time required for each exposure, and the alternate occlusion and exposure may need to be repeated 2 or 3 times.

If the visual acuity of the two eyes is not equal, the spherical correction must be revised and the one spherical made weaker or stronger, as may be needed for equalisation. During the monocular test the accommodation having been more active at one period than another, the selected spherical for the one eye was relatively stronger than that selected for the other.

The visual acuity test usually suffices but, if further confirmation is required, it can be done by adding to each correction a + 3D. lens - thus making the eyes artificially myopic, and measuring the far point of each eye; or by adding a + 1D. to each eye when the vision of each should be 6/18. If the one has better vision than the other, the two eyes are not equalised. In this last mentioned test, time should be allowed for the accommodation to relax if it can.

(To be concluded)

Safeguarding of Industries and The Chemical Glass Trade.

Mr. J. Monerieff, managing director of the North British Glass Works, Perth, in a letter to a Glasgow newspaper writes: —

"I notice with regret that there has been in Glasgow a meeting of protest against the Key Industries Bill. Having read the speeches as reported in your paper of the 9th inst., I cannot but conclude that considerable ignorance prevails in connection with the section of the Bill that specially relates to key industries. 1. With regard to optical glass, it is admitted that the value of the actual glass required for scientific instruments is small compared with that of the instruments themselves. But, on the other hand, if Germany reserves their supplies of their best quality glass for German instrument makers, as I am informed is the case, then it is obviously imperative that this country should foster the manufacture of optical glass, as otherwise we shall lose not only that, but the scientific instrument industry in addition. 2. With regard to the chemical glass, it is impossible to maintain the industry under open competition from Germany and Czecho-Slovakia. This is due to lower wages and low exchanges in the countries named.

"When it is carefully considered to what extent most processes of manufacture depend upon chemical research and examination at some stage, it will be readily understood how necessary it is in the interests of the country to maintain the industry. I am connected with a company which carries on the manufacture of chemical glass. This department was commenced in 1915 at the urgent instigation of the Government, who in view of the fact that we had for many years prior to the war carried on research in our own laboratory on heat resistance glasses, thought us most likely to come quickly to the country's aid in the crisis. We agreed with reluctance, as we had no capital available, neither furnaces, nor buildings suitable, and no skilled labour. However, as we fully realised the serious position,

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

we undertook the work, although for the purpose of erecting and equipping a complete installation we had to borrow over £10,000. We also had to undertake the entire training of labour, and in view of the shortage of even unskilled labour, this was a very arduous task.

"Our aim and intention was to produce chemical glass at a small profit, notwithstanding that any price demanded might have been obtained. Unfortunately, owing to unforseen difficulties of manufacture, unexpected rises in wages, raw material, coal and freight, the industry was carried on at a trading loss of over £12,000 in the first five years. Thus we are left with large extensive premises erected on borrowed money, and with the market entirely flooded with articles of German and Czecho-Slovakian origin far under our cost of production. On commencing we were solemnly assured that the industry would be fostered after the war, and naturally we have never ceased to urge the fulfilment of these promises.

"The Key Industries Bill is the long-delayed answer which, although far from adequate, will at least help us to retain a portion of the trade. It is frequently stated that the key industries section should have been treated as a separate Bill. This was urged by the chemical and optical glass manufacturers, who strongly deprecated the mixing of the support of vital key industries with measures relating to anti-dumping and equalisation of exchanges. I note that the protection of genuine key industries is not seriously opposed, but the method of protection provided by the Bill is disliked. I would point out, however, that deferred support will be too late, as it is no good bringing in protective measures when the industry is dead and the capital lost."

Recent Optical Patents.

Complete Specifications Published.

1917.

166173. Taylor and Gray, Trigonometrical machines.
166179. Dyer, Range-finders.

1919.

165831. American Optical Company, Ophthalmic lenses.
165836. Vickers, Ltd., Sighting apparatus for use with ordnance.
166217. Taylor, Telescopes, microscopes and the like.
166231. Kletz and Pearson, Glass grinding and bevelling machines.
166218. Imperial Trust for the Encouragement of Scientific and Industrial Research, Sears and Brookes, Method of and apparatus for measurement and/or standardisation.

1920.

148152. Optische Anstalt C.P. Goerz Akt-Ges., Periscopes.
165893. Coverdale and Jessett, Screen for daylight cinematograph screens.
165915. Shaw, Surveying instruments.
166011. Gros, Indicating devices for measuring apparatus.
166015. Gilpin, Cinematograph screens.
166028. Kleim, Production of photographic negatives for colour printing and colour photography or the like, and apparatus therefor.
166304. Elias, Optical projection apparatus.
166344. Pfenninger, New means in colour cinematography.
166362. Sinclair and Co., Ltd., Eyeglasses.

Mechanical, optical, steam and electrical toys in great variety are to be seen by members of the trade in the showrooms of Messrs. Bedington Liddiatt & Co., Ltd., 16-18, Bayer St., Golden Lane, E.C.1. Some illustrations appear in our advertising columns (Supplement, p. 3).

From Messrs. Jackson Bros., Ltd., of the Technical Works, Armley, Leeds, we have received a price list of draughtsmen's requisites, including instruments—especially slide rules—and drawing papers, showing substantial trade discounts. The firm offer unnamed price lists and a small display assortment for the use of retailers.

The price of rubber has now levelled to 9d. per pound, which should have a favourable influence on the cost of ebonite, used to such a considerable extent in the manufacture of various instruments.

The attention of British subjects resident in this country who have pre-war debts owing to them from branches outside Germany of German undertakings whose Head Office is in Germany, is drawn to the fact that apart from their remedy against the branch, they may be entitled to claim payment alternatively from the Head Office. The Board of Trade says that in the event of there being any doubt as to recovery of such debts from the branch, British creditors will be well advised to file a claim against the Head Office with the Enemy Debts Clearing Office, Cornwall House, London, S.E.1. It is essential, however, that any such claims should be received by the Clearing Office before the 30th September.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Rx

LYONS' SERVICE

Our Aims are
Quality & Promptness
For High Class Rx Work.

——TRY US.——

Stock Orders solicited

FULL STOCKS:—Gold and G. F. Cable Frames and Astigs, Rimless Mounts, Shell Goods, Cases, Cords, Chains and UNCUT LENSES.

F. H. C. Lyon,
Wholesale & Manufacturing Optician,
59-61, Hatton Garden, London, E.C.1

Telegraphic Address:
CYLTORREXO, SMITH, LONDON.

Telephone No.:
HOLBORN 1203.

Regd. Trade Mark.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

F. PARKER WOOD,

Wholesale Manufacturing Optician,

47, MARK LANE, E.C.3

Immediate delivery from stock:

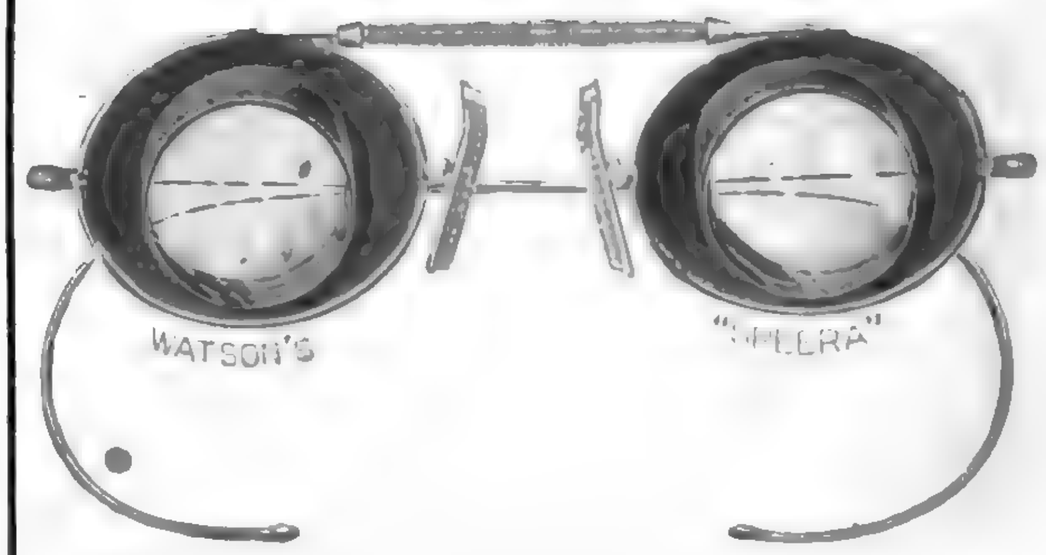
TELESCOPES
FIELD GLASSES
PRISM GLASSES
MICROSCOPES
ANEROIDS & CLOCKS
BAROGRAPHS
SEXTANTS
BINNACLES
COMPASSES

CHRONOMETERS, New & Second-hand

Repairs a Speciality.
Clinicals and all other Thermometers.

PARALLEL GLASSES of every description.

WATSON'S "SPEERA" BINOCULAR MAGNIFIERS.



A pair of ACHROMATIC lenses are mounted in a spectacle frame, which may have either an adjustable spring bridge, or an ordinary saddle. For the best effect to be obtained, the eye-centres must be accurately specified, and if saddle bridge is used, it must be made of the proper height and shape. The necessity for these precautions will be appreciated when it is known that the lenses have to be set in the frame at a slight angle, so that they both converge precisely on the focal point. The variety of uses to which this Magnifier can be put will ensure a large sale.

It is proposed that names shall be kept of opticians willing to supply them, and applicants will be referred to their local opticians for measurements.

Watson's will be pleased to hear from opticians, who would interest themselves.

Full particulars from :—

W. WATSON & SONS, Ltd.,

313, High Holborn, London, W.C. 1

Works—Bells Hill, High Barnet. Established 1837

C. SWAIN, Ltd.,

51, Strand, London.

A B C Code 5th Ed.

'Phone:—GERRARD 5179. Factory: FOREST GATE.

UNCUT
Sphs
Sph Cyls
Plano Cyls

A.O.C. EDGED
Peris & Bi
Cx & Cc etc.,

at Best Prices.

Canadian Goggles.

American Styles, made in Canada to supply demand for British goods. A full line of colored lensed goggles in metal and zylo frames, with and without leather, metal and collapsible dust shields for motor, motorcycle, all out-doors, all industrial uses.

Send for Catalogs or Samples.

CANADIAN GOGGLE Co.,

Manufacturers,

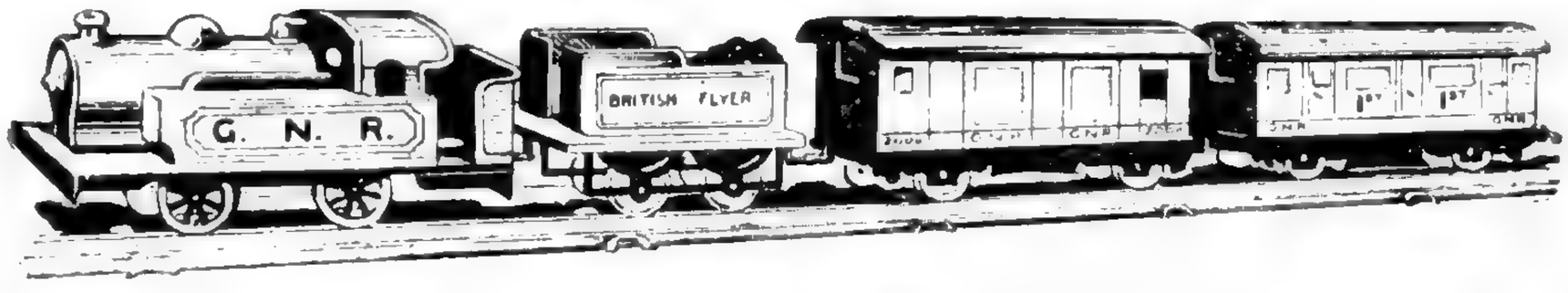
37-39 King William St., HAMILTON, ONT.

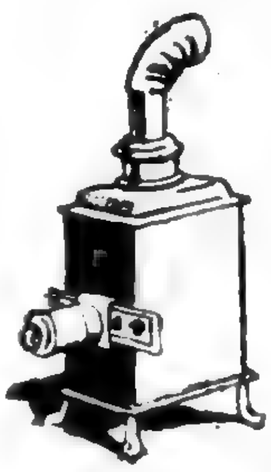
Sir William Crookes' Ultimate Glass was, as the name implies, his very last effort—the ultimate result of his many years work. Crookes A and B were Sir William's early attempts, with which however he was by no means satisfied. Crookes A and B are certainly Crookes; but the latest form of Crookes Glass is that which is under the absolute control of Sir Wm. Crookes Anti-Glare Glass Co., Ltd.

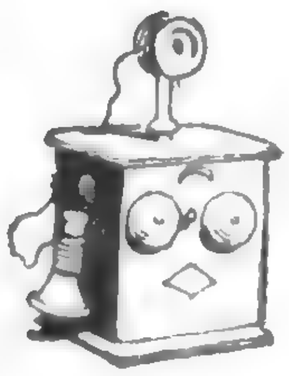
Digitized by Google

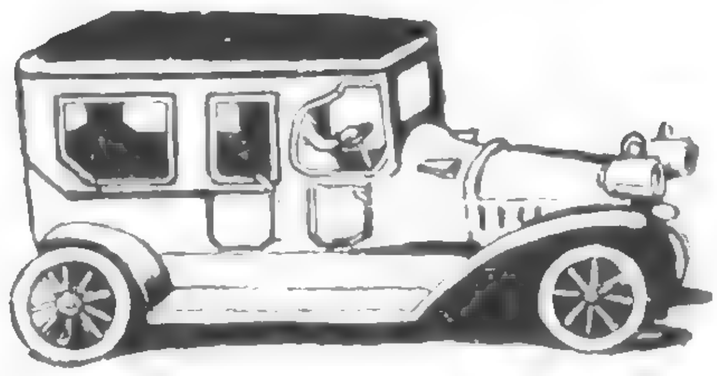
Original from THE OHIO STATE UNIVERSITY

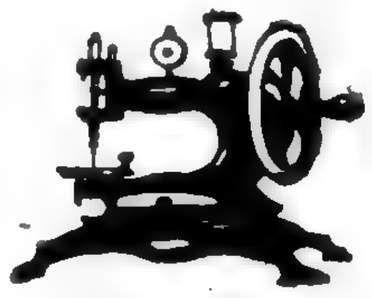
CLOCKWORK, STEAM & ELECTRICAL TOYS.

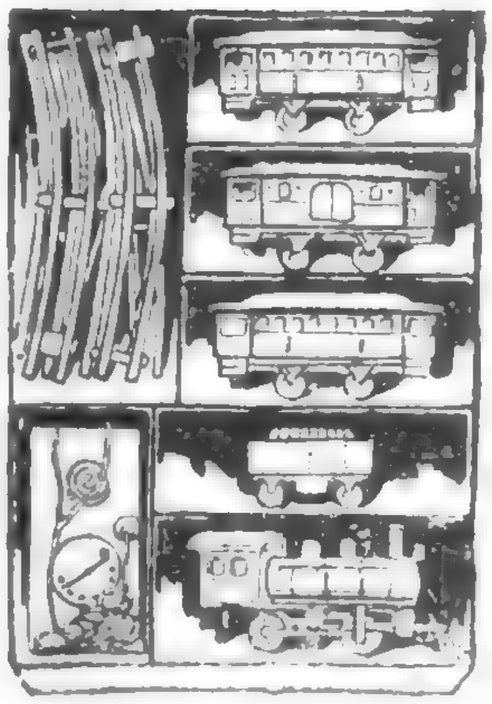






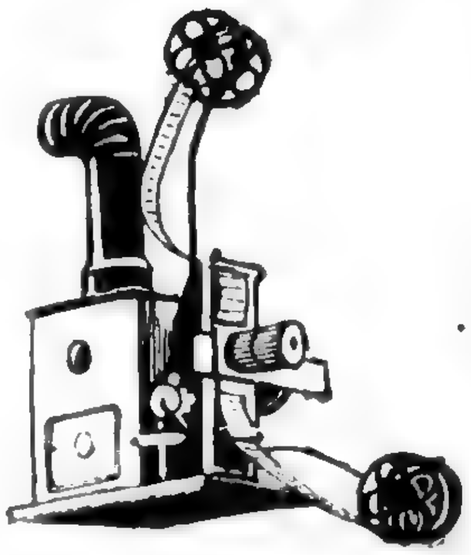






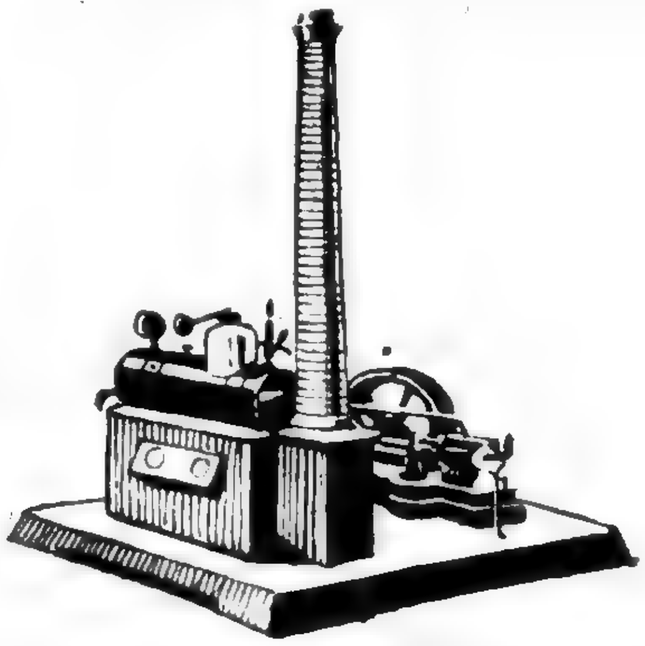
Amongst our collection of over 5000 Toys, we have in stock a complete range of Mechanical Lines, including Clockwork, Steam and Electrical Toys at prices ranging from One Shilling to Twenty Pounds. We carry a varied stock of American Flyer Trains with full equipment.

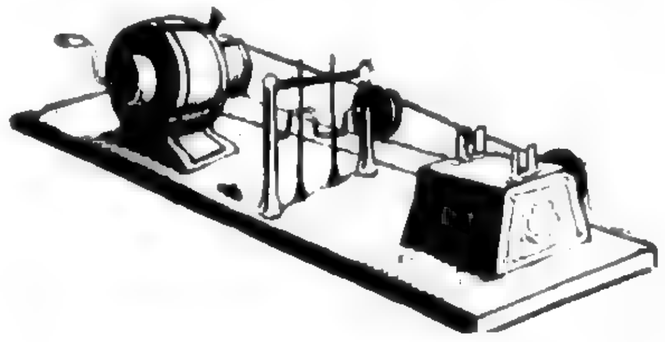
A visit to Our Showrooms will be to your advantage.











BEDINGTON, LIDDIATT & Co., Ltd.,

16-18, BAYER STREET, GOLDEN LANE,

LONDON, E.C. 1

Telephone:
CITY 2472—2473

Telegraphic Address:
PLAYING, LONDON.

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

A GOOD ADVERT.

May be convincing but the

SEYMOUR

are supplying PREMEX Finished and Rough

TORICS

That are absolutely so and moreover are true to Base 6.0 and Highest Grade.

MAYFAIR 851 **3 & 4, BARRATT STREET, LONDON, W.1**

C. BAKER 244 HIGH HOLBORN LONDON

Estab. 1765

REPAIRS

to all kinds of Scientific Apparatus carried out in our own Factory.

Work Returned Promptly. Charges Low

OPHTHALMIC AND SCIENTIFIC
MOULDINGS
Supplied in any Curvature and Glass.
CROOKES A SPECIALITY.
REYNOLDS & BAILEY, 15-19, VINE ST.,
LONDON, E.C.1

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
G. C. DYMOND. M.I.Mech.E., F.I.C.P.A
W. P. THOMPSON & CO.,
12, CHURCH STREET, LIVERPOOL.
Chartered Patent Agents.
H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

DIXON & HEMPENSTALL,
Wholesale and Manufacturing Opticians,
12, SUFFOLK STREET, DUBLIN.

Telegrams "Optics, Dublin."

T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and AERONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
ESTABLISHED 1878 TELEPHONE CITY 419

FINEST
ROUGH CYLINDER BLANKS,
Also good 2nd Selection
A very attractive proposition for Export and cheaper work.
CHANCE'S GLASS USED.
ACTUAL MANUFACTURERS
ASSOCIATED OPTICAL WORKS, Ld
5, Queen's Buildings, London, W.1
Near Tottenham Court Road.
No Connection with any other Firm. Telephone: Museum 2216.

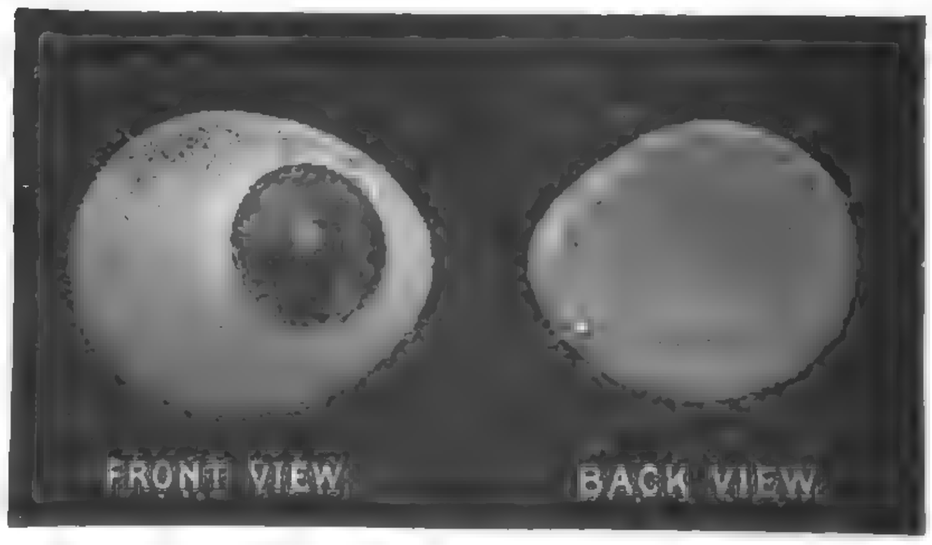
PERCY S. DE SAULLES.
Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES.
Micro Cover Glasses, Glass Cells and Cavity Slips, etc.
The Platts, Amblecote, Stourbridge.



OPTICAL BLOCKS
To illustrate all features of Optical Service. Write for Lists.
Chemists' Design Service,
12, Humberstone Gate, Leicester.

SPECTACLES & EYEGLASSES.
Their Forms, Mounting and Proper Adjustment
by R. J. PHILLIPS, M.D.
Fourth edition revised with 56 illustrations.
Price 6s. 6d. Post Free 7s.
THE HATTON PRESS, Ltd., 125, Fleet Street, London, E.C.4

SNELLEN'S IMPROVED ARTIFICIAL EYES
PACHE & SON, 75, Station St., Birmingham.



MAKERS TO THE PRINCIPAL HOSPITALS.
Selections sent to Surgeons. Also Makers of the ordinary Shell Eye

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

"You Cannot TRADE SQ MARK *Buy Better"*

STEVENS' QUALITY
Optical Goods

UNQUALIFIED approval meets this celebrated line wherever introduced.

WE are sole agents for the United Kingdom and can invariably supply your requirements from stock.

One Quality Only—The Best Made

1/10th 12ct. Gold Filled

Specialising in the Fingerpiece Mount

Send us your enquiries for
Spectacles and Eyeglasses—Frames and Mountings

Complete Catalogues on Application

H. WILLIAMSON Ltd.
Optical Section
87/89 GREAT SAFFRON HILL, LONDON, E.C.1

General Optical Supplies—Prescription and Repair Work—
Fittings and Instruments—Optical Machinery

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is 3d per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

FOR SALE, second-hand ophthalmometer, offers and enquiries to Box 3460, c/o "The Optician," 125, Fleet Street, E.C.4.

£35. Small optical stock, comprising lenses, frames, rimless fitting sets, lens chest, orthoscope and adj. table, etc., for disposal. Full particulars. Apply, Box 3401, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED. Grindstone trough for 18 in. stone, must have 1¼ bearings. Apply, Coton & Hamblin, Wellington Street, Woolwich.

FOR SALE. Sutcliffe Keratometer for electric light. Sound condition. £12. Apply, Smith, Optician, Scarborough.

SECOND-HAND prism binoculars. Watson Sunica intense X8 graticule eyepiece focusing £5 10s. Optician, Castle Street, Tonbridge.

FOR SALE. Standard Lens drilling machine. Approval. F. Goodman, Chatsworth Road, Luton.

WANTED, the following back numbers of "The Optician," 1140, 1154, 1159, 1171, 1172, 1173, 1203, 1212, 1246, 1265, 1280, 1307, 1321, 1352, 1353, 1356, 1473, 1493, 1495, 1496, and 1522. Apply, to Box 3457, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

WANTED, a sight-testing business in London preferably on suitable premises. Box 3462, c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 8*

OPTICIAN certified, experienced branch manager, would like similar post. Midlands preferred. Box 5632, c/o "The Optician," 125, Fleet Street, E.C.4.

GOOD all-round gold worker, excellent references could take charge. Box 5633, c/o "The Optician," 125, Fleet Street, E.C.4.

BERTH wanted by first-class all-round gold worker used to taking charge. Box 5634, c/o "The Optician," 125, Fleet Street, E.C.4.

COMPETENT sight-testing assistant with knowledge of Photography wanted for Manchester. Apply, Box 5635, c/o "The Optician," 125, Fleet Street, E.C.4.

REQUIRED for India, thoroughly competent optician, qualified preferred. Apply, Lawrence & Mayo, Ltd., 19, New Oxford Street, W.1.

TURNERY WORK IN EBONITE

Small turnery work of all kinds undertaken. Rod and Sheet supplied in any quantity, cut to order. Enquiries Solicited.

BURGE, WARREN & RIDGLEY LTD.
91 & 92, GT. SAFFRON HILL, LONDON, E.C.1

THE REPAIRING OPTICIAN

By JOSEPH FRAY, *Practical Optician.*

F'cap. 8vo (6¾ + 4¾). Cloth.
110 Figures. pp. vi + 183. 8/6 net. Post Free 8/10.

¶ This book is intended to help beginners, apprentices and amateurs to overcome many of the smaller problems for the solution of which they might look to larger text-books in vain. The subjects dealt with include tools; the making and tempering of small tools; frames; repairs; rimless lens mounting, and lenses.

HENRY FROWDE, HODDER & STOUGHTON,
The Lancet Building, 1 & 2, Bedford St., London, W.C.2

BLUE GOLD

Well hardly that, but we can do White or Yellow.

Write for samples and Prices. Rimmed and Rimless. Style and finish guaranteed.
IT WILL PAY YOU.

HAMPTON OPTICAL CO., Ltd.,
28, ESSEX STREET, BIRMINGHAM.

TO LENS MANUFACTURERS

For Disposal (In Perfect Condition)

1 12 Spindle Machine for Bi & C-/L Lenses
1 20 „ „ „ Meniscus „
1 10 „ „ „ Deep Bi, Peris & Meniscus Lenses

Together with Blocks. Also a large quantity of White Blanks (Ovals and Rounds), And Dropped Blanks.

Full particulars on application to Box 3454, c/o "The Optician," 125, Fleet Street, E.C.4

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,
DANDURAND BLDG., MONTREAL.
Cable "Optical" A.B.C. Code 5th. Edition.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Prism Binoculars, Field & Marine Glasses.

For a Short Time only. Special Offer of above by well-known makers, bought under conditions and prices that cannot again be repeated.



PRISM BINOCULARS. STEREOSCOPIC.

In 6, 8, 10 and 12x. Ladies size 6x16 mms. O.G's. Special Marine patterns, in 6 and 8 x, 24 and 30 mms. O.G's.

Special Field or Race patterns, 8, 10 and 12 x, 22 and 24 mms. O.G's.



SPECIAL HIGH POWER PRISM BINOCULARS.

In 12 and 16x with 40 mm. Object Glasses.



HIGH GRADE MARINE GLASSES.

In 24 and 26 Line. Only a few dozens left.

For Quality of Workmanship, combination of Power and Definition these cannot be surpassed



A Large Range of **FIELD GLASSES,** from a Few Shillings upwards for all purposes.

SELECTIONS ON APPRO. TO RECOGNIZED RETAILERS ONLY.

JOHN BAIRD, "HERALD" OPTICAL WORKS,
Manufacturing Optician, 68 & 70, MITCHELL ST., GLASGOW.
Telegrams: "SPECTACLES, GLASGOW." *Telephone: CENTRAL 541.*

Digitized by Google Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

***A.*—Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

QUALIFIED Optician required as manager. Apply, stating age and experience to G. C. Bateman, Ltd., 91, High Street, Maidenhead.

EXPERIENCED all-round glazier seeks situation rimless edging, drilling, fitting and cementing. Write, W.B.C., 114, Kilburn Park Road, Kilburn.

ASSISTANT, age 18, requires situation. Attend customers and general jobbing. London or provinces. Apply, I.J., 52, Battersea Park Road, S.W.11.

YOUNG LADY wanted for order department, previous experience essential. Good wages and permanent position to right person. Apply by letter, stating full particulars to Elliot Optical Co., 104/5, Great Saffron Hill, E.C.1.

MANAGER. 3 years' experience in sight-testing with thorough knowledge of workshop routine desires change Eastern or South Eastern counties preferred. Permanent. Good reference. Box 5630, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN, 21, desires situation as assistant to retail Optician experienced in sight-testing, etc.. Box 5631, c/o "The Optician," 125, Fleet Street, E.C.4.

CARETAKER, and assist in warehouse, etc. Young ex-service man, strong and willing. Married, no children. Good references. Please address F. Rowe, 11, Finck Street, S.E.1.

B.O.A. desires position, City or West End, extensive wholesale and retail experience. Write, Box 5639, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. First-class salesman, until recently manager of one of the largest retail shops in London, is open to accept appointment in a business that is capable of increase and would be willing to receive remuneration by results, or would consider investment of £500 to £1,000. Partnership or otherwise. Write, H. Bevan, F.S.M.C., 43, Hastings Road, Southend-on-Sea.

GENTLEMAN, thoroughly experienced manufacture optical and scientific instruments. Machine shop work, assembling and adjusting, requires position, could assist management. Box 5636, c/o "The Optician," 125, Fleet Street, E.C.4.

SIGHT-TESTING assistant, 24, offers services to good class firm or employer. Nearly two years' excellent experience. Sound frame fitting and repairs. Trustworthy. State approximate salary. Apply, Raymond Worgan, Rumney, Cardiff.

YOUNG LADY, D.B.O.A., a daughter of a qualified optician seeks a situation in London. For sight-testing, frame fitting, has a general optical experience, typewriting, etc. Box 5637, c/o "The Optician," 125, Fleet Street, E.C.4.

MANAGER Wanted. Qualified. Age 35-40. Branch shop North of England permanency, reply giving full particulars, experience, etc., and salary required. Box 5638, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED traveller. London provinces and abroad desires engagement to manufacturing opticians, including surveying instruments and drawing office materials. Fluent French. Highest credentials. Box 5640 c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED. Sight-testing assistant, preferably qualified and with knowledge of amateur photography. Apply, P. Harrison, F.B.O.A., 120, Commercial Road, Portsmouth.

COMPETENT surfacer seeks situation thoroughly experienced. Torics, cyls., sphere. Apply, W.M., 32, Vernon Gardens, Seven Kings, Ilford.

FRENCH optician seeks employment. Good references. Write D.B., 42, St. Elmo Road, Shepherd's Bush, W.12.

SMART energetic young man desires position to travel for wholesale house. Moderate terms. Box 5629, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST Assistant wanted by provincial jewellers and opticians. Applicant must be smart salesman and reliable sight-tester, capable of doing watch repairs, good wages and progressive position to quick businesslike man. State age, experience to Box 5617, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Gentleman, 24, studying for B.O.A. Exam., requires post where experience may be gained, low salary. Box 5618, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., D.B.O.A., seeks London engagement. 6 years' workshop and consulting room experience. Accustomed to checking and general supervision. Apply, "Toric," c/o Ebbage & Son, Ophthalmic Opticians, Eden Street, Kingston-on-Thames.

SIGHT-TESTING Optician. Expert retinscopy, etc. Good personality and salesman. With long experience. Tactful and reliable, disengaged. Box 5619, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED traveller required by manufacturing opticians, preference for investment view to partnership. Full particulars to Box 5625, c/o "The Optician," 125, Fleet St., E.C.4.

FIRST CLASS rimless fitter seeks situation, edging and cementing, moderate 8 years' experience. Gladstone Cottage, Lilian Road, Streatham, S.W.

ASSISTANT, 20, smart address, good refractionist, passed B.O.A. examination in May. Thoroughly practical at bench, capable taking charge, desires position with good class optician end of September. Preferably within 50 miles Manchester. Apply, Box 5613, c/o "The Optician," 125, Fleet Street, E.C.4.

GOOD all-round man seeks situtation all repairs, glazing and rimless work experienced in retail work and requirements. Box 5615, c/o "The Optician," 125, Fleet St., E.C.4.

MAN with 18 years' mechanical experience seeks responsible position with manufacturing opticians. Fully capable of taking charge. Highest references. Box 5616, c/o "The Optician," 125, Fleet Street, E.C.4.

PART-TIME. London refractionist, F.B.O.A. Medical Student, nominal salary. Apply, "Medico," c/o "The Optician," 125, Fleet Street, E.C.4.

SITUATION as branch manager or first assistant required by an experienced optician, permanency desired. Box 5606, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, female rimless drillers and fitters, first class work, permanent. Apply, Box 5547, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. (35), wholesale and retail experience desires change. Any capacity. Good address, used to management. Keen salesman. Would represent wholesale or manage branch for a retailer. Conscientious and ambitious. Please state approximate salary. Box 5612, c/o "The Optician," 125, Fleet Street, E.C.4.

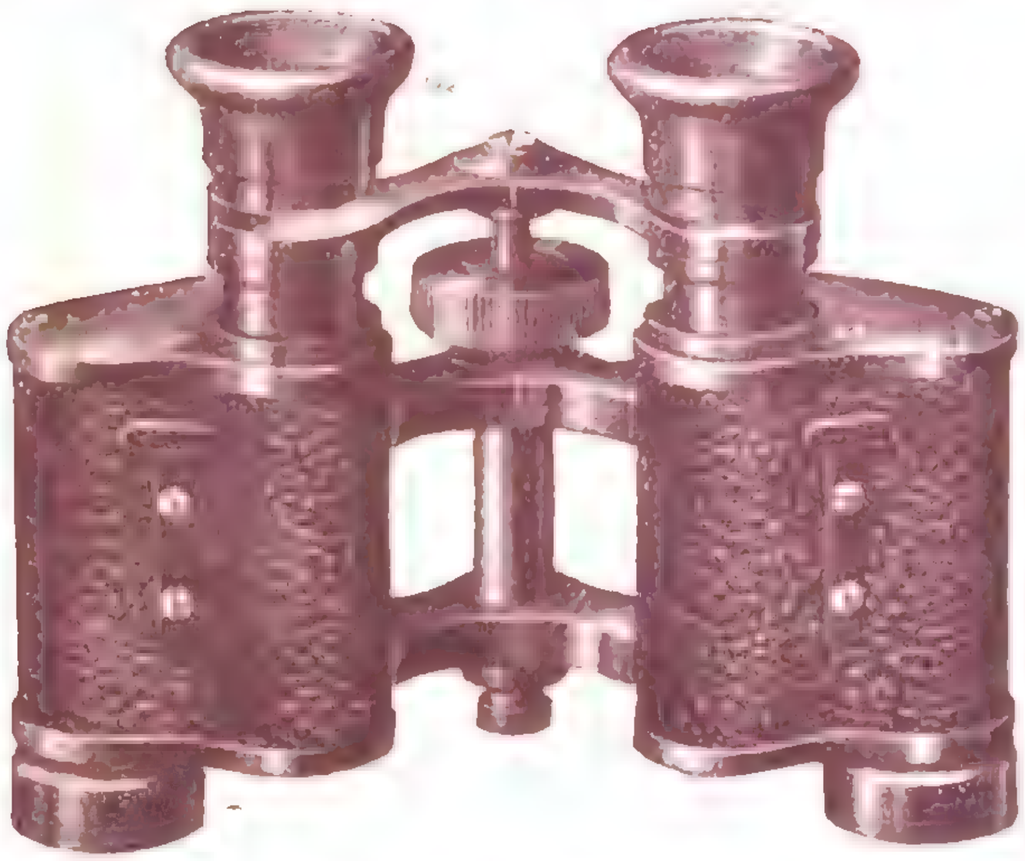
DESIRING a position abroad, capable lady with 5 years' practical experience in sight-testing business in all its branches wishes to hear of a family where she could assist in business, also act as companion help. Age 30. Highest references offered and required. Apply, "E.M.," "Lynd-hurst," Wash Lane, Clacton-on-Sea.

Concluded on page 6.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

PRISM BINOCULAR SEASON!

ARCHERS'



"PROSPECTOR"

THE GLASS THE PUBLIC WANT.

Small, 8 times Screw-focussing, Stereoscopic, First-rate Optical qualities.
Well constructed, highly finished and handsomely cased.

LOW IN PRICE.

See the "PROSPECTOR"

R. ARCHER & SONS, Ltd.,

WHOLESALE OPTICIANS,

1, AMWELL STREET, LONDON, E.C.1

Digitized by Google Original from THE OHIO STATE UNIVERSITY

THE OPTICIAN
Reg. at G.P.O. as a Newspaper

AMERICAN OPTICAL COMPANY, LIMITED.

Wellsworth Gold-filled Spectacle Mountings for Perfection of Detail.



When you buy staples, Gold-filled Frames and Mountings for example, you want quality first. No freak of style or function is looked for—merely downright good clean-cut quality clear through.

Such quality in Gold-filled ware is possible only where experience, equipment or organisation and other manufacturing conditions are ideal, as they are in the great plant of the American Optical Company.

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C.4. (Printed by The Century Press, Fulham.) Aug. 26, 1921.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT·MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1588 FRIDAY, SEPT. 2, 1921.

ROSS LENSES AND BINOCULARS.

There are no finer instruments obtainable than Ross Lense and Ross Stereo Prism Binoculars. The name of Ross is a guarantee of their quality.

A generous supply of advertising literature and showcards is supplied to all Ross dealers.

Send for our new catalogues and terms.

ROSS Ltd., Clapham Common, LONDON, S.W. 4

ELLIOTT'S Rx Price List

shows

Substantial Reductions.

High standard of work fully maintained— Perfectly satisfactory service in all ways. Write for New List and Complete Set of Stationery which will be sent free of charge.

104/5, GT. SAFFRON HILL, E.C.1



AS PRISM BINOCULARS

"SPORTS"
"PROSPECTOR" Are
"SURVEYOR" Unmatched.

SEE THEM!

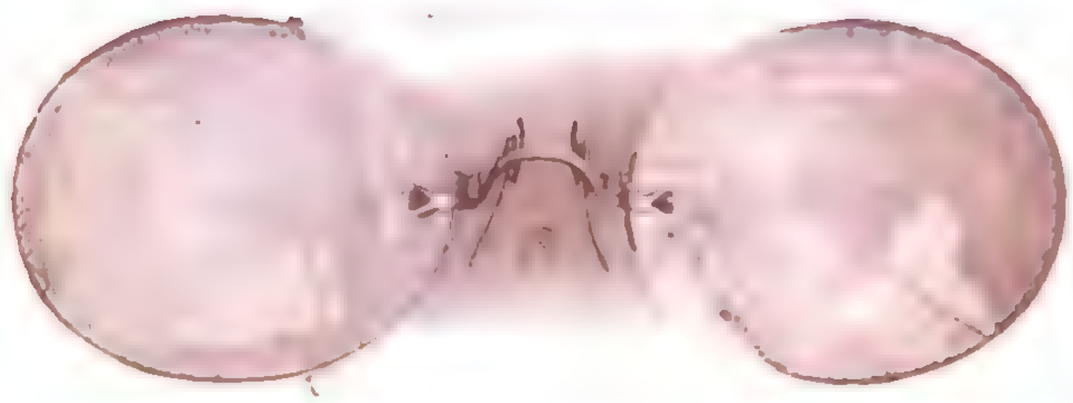
R. ARCHER & SONS, Ltd.,
1, Amwell Street, London, E.C.1

Reg'd at the G.P.O. as a newspaper **PRICE 4d** *Subscription post free 12 months 17s*
Postage in United Kingdom 1s. *The Hatton Press, Ltd., 123-5, Fleet St., London, E.C.4*

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

AMERICAN·OPTICAL·COMPANY, LIMITED.

THE FAMOUS FITS-U



There have been many fingerpiece mountings offered the trade since the inception of the Wellsworth Fits-U, but this famous mounting has met all competition, has passed the "acid test," has won a place for itself in the hearts of optical men who insist on selling only the best.

In spite of the ever increasing demand for the Wellsworth Fits-U mounting, necessitating increased production, the Wellsworth standards of quality have been rigidly maintained as is evident by the expressions of satisfaction that are received daily from wearers and from all members of the trade who handle this popular Eyeglass.

WELLSWORTH

TRADE Ⓐ MARK (Regd.

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"Stork"

Automatic  Eyeglass

BRITISH MADE.

Holder

PAT. APPD. FOR

Constructed on an Entirely New Principle, this chain is Mechanically Perfect.

It embodies all the essentials of the perfect eyeglass holder and is a chain that can be recommended with confidence.

Strongly made yet neat and well-finished. Action combining simplicity with Certainty. Locking Bolt makes accidental recoil of chain impossible. British Made and reasonable in price. Chain can be worn at any length.

Samples and prices gladly sent on application to

WALTER H. THOMPSON,

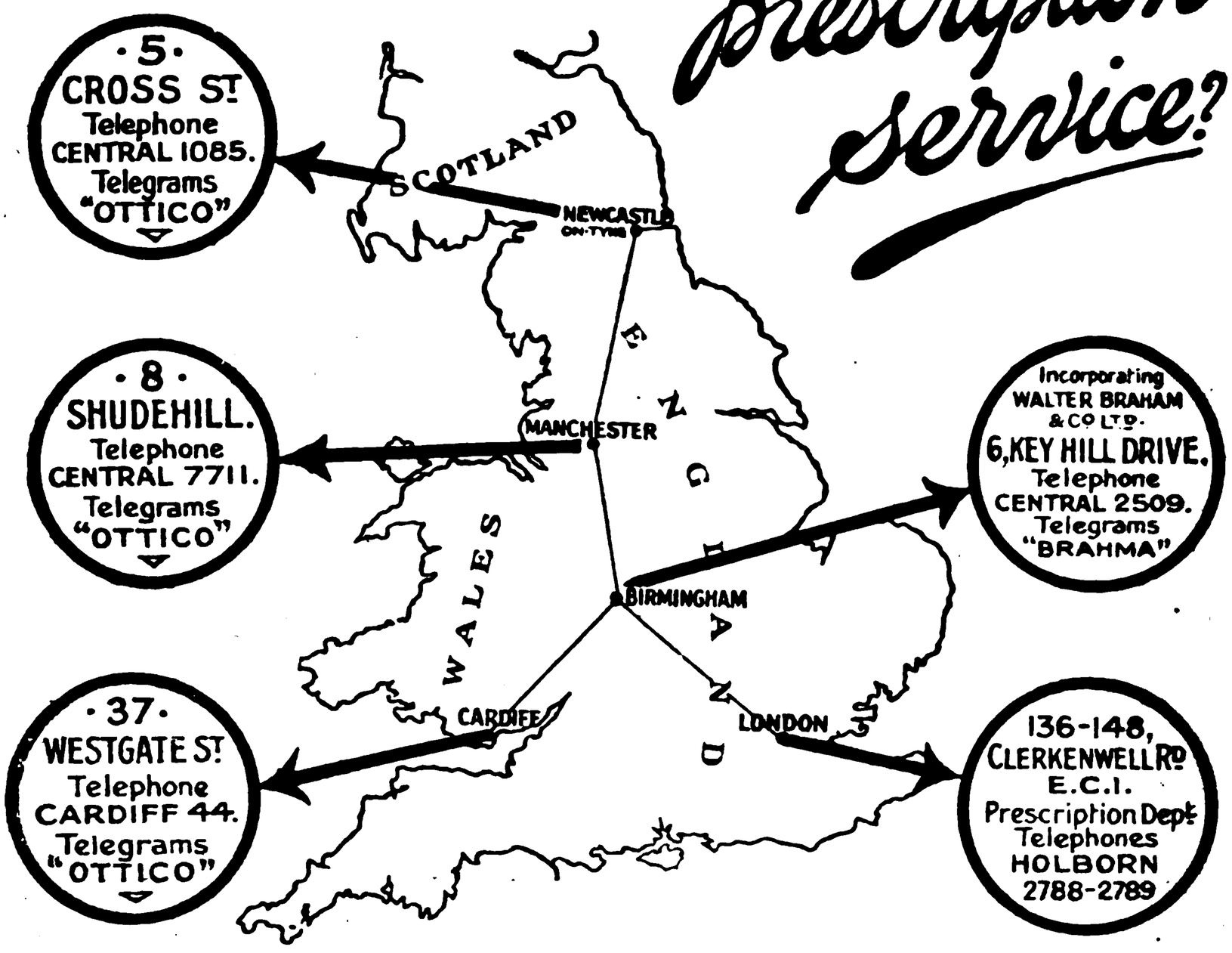
: 66, HATTON GARDEN, E.C. 1 :

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713 (Two Lines).

Digitized by Google Original from THE OHIO STATE UNIVERSITY

J&R.F LTD

Why not link yourself with our prescription service?



Each Branch has a Complete Prescription Equipment.

LINK QUALITY SERVICE BRAND
Reg'd Trade Mark.

J & R. Fleming Limited.

136-148. Clerkenwell Road, LONDON, E.C.1.

Telegrams: "OTTICO" SMITH, LONDON.

J&R.F LTD

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
Col. & Ald. Sir CHARLES C. WAKEFIELD, Bt., C.B.E.

Upper Warden
The Rt. Hon. VISCOUNT HILL.

Renter Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Director of Examinations
The Rt. Hon. Sir WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS

of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., on Oct. 31st, 1921, and during the first week in November.

Last date for Entries, Sept. 30th.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

THE OPTICAL ENGINEER
AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,588

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices
123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, SEP. 2, 1921.

End of the War.—Last night was, by Order in Council, fixed as the date of ending of the State of War, bringing to a tardy close some of those infringements of liberty in commercial matters to the "administration" of which our new bureaucracy clings with such devastating tenacity. This painful and indeed disgraceful matter of Government interference in the business and social life of the people, prolonged to gratify party prejudices for mere political expediency, during more than two years past, is all too familiar a topic. It is refreshing to have some excuse (though not yet nearly enough, unfortunately) to look on the whole wasteful extravagance as a nightmare of the past. We shall draw attention here to just one of the minor "reforms" to take effect from to-day. The regulation prohibiting possession of wireless apparatus, save with the consent of the Postmaster-General, now disappears. Such great progress has been made in the United States of America, in the development of small wireless outfits for private use, that it may be hoped now a real effort will be made to popularise the sale of these goods through British optical and scientific instrument dealers.

* * *

Key Industries Bill.—Many enquiries have been made at this office for the text of the Safeguarding of Industries Bill, which received the Royal Assent and became an Act of Parliament on August 18th. We can only say that at the time of going to press (although we

Digitized by Google Original from THE OHIO STATE UNIVERSITY

have waited for it until the last moment) this text is not yet available. The cause of the delay is a mystery, as we said last week. Perhaps the Government experts responsible for textual accuracy are away on one of their long vacations. Or perhaps, the appropriation to H.M. Stationery Office is not yet large enough to secure an approach to such expedition with which publication can be made by a commercial printer. We can only add that we have no doubt it will be possible to print the Act in our next issue, as of course is intended.

* * *

The Spectaclemakers' Examinations.—The fifty-first examination for the diploma of the Spectaclemakers Company will be held at St. Bride's Institution, Ludgate Circus, E.C., and the City of London School, commencing on Monday, October 31st, prox., and continuing during the first week in November. The latest date for entries is Friday, September 30th inst.; and intending candidates are advised to make application early, as time and accommodation is limited at St. Bride's Institute. Correspondence must be addressed to the Acting Clerk of the Company, Temple House, Temple Avenue, E.C.

* * *

Rotating Elements.—An interesting contrivance has been installed on the "Quest," which is now being fitted out in St. Katherine's Dock. This is a "clear view screen" of which the glass is revolved rapidly by means of a motor, with the result that snow and wet is prevented from obstructing the navigator's view. This plane glass screen is, of course, the simplest of all optical rotating elements, but may recall to the minds of some of our older readers the introduction of a most ingenious French invention, the "cyclostat," a rotating right-angled prism which optically stabilises the rotation of any object. The principle of the cyclostat, first described in these columns in 1891, has been introduced in several instruments of importance; and it ought to be applied to photographing the indications of strain in a quickly revolving model air-screw, by the process that Prof. Coker has developed. Such investigations have importance that is newly emphasised by the disaster to the airship R38 last week. The structural defects to which that was due were perhaps partly at least, a result of some error in calculating stresses in the framework of the vessel.

* * *

Calculations of the distribution of stress can be checked easily and effectively by observations on a transparent model with polarised light, as was explained in a lecture by the late Prof. Silvanus Thompson, reported in our columns some years ago. But for any given strain applied to some part of a structure, the distribution of resulting stress depends on the mechanical nature of the material; and in this sense there are not enough different transparent substances to correspond with the variety of materials used in engineering. Prof. Thompson's visual tests need, therefore, to be amplified by similar photographic tests, made with those invisible rays to which metals, wood, etc., are transparent. No doubt the progress of industrial research will lead to this improvement—and even further; for the changes of molecular structure that accompany a development of weakness from so-called fatigue, may be detectable on the fluoroscope or photographic plate.

* * *

A Variable Sphere.—For further examples of rotating elements we have only to think of the variable prisms. One of these, introduced to the trade many years ago by Messrs. Raphael's, consists of two plano prisms. Another is a pair of sphero-prisms, with equal and opposite spherical curvatures in contact. Here the deviation of a ray of given incidence can be calculated for in degrees, etc., to give every corresponding principal angle of the prism by the method explained in our issue of July 8th, and so the dial can be graduated. If a little aberration is ignored, a variable cylinder as well as a variable sphere can be had by means of two glass elements rotated relatively to one another. If (for the plus power) we suppose that a thin slice is removed from the surface of a glass cone, the thickness of this slice corresponding throughout to the sagitta for the needed aperture, we shall have a rod (of approximately plano-cylindrical curvature) which when crossed with a like rod, the plane surfaces in contact, will produce a lens of variable spherical and cylindrical powers. The rods would be graduated like a footrule in diopters, of course, with oblique lines to show positions of crossing for cylindrical effects. Then, neglecting the mechanical difficulty of construction, we have only to suppose such rods made circular in the plane of the plane surface, and when these circular rim elements are placed together to cross one another at right angles, their rotation will give varying cylindrical and spherical refractions. For minus powers, of course, the principal "toric" curvatures must be reversed. Small trial lenses mounted on rotatable rims, as in ophthalmoscopes and some other ophthalmic instruments, are the practical solution of all such problems; but some interest attaches to other although, in the present state of glass working, less convenient expedients.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

The Routine of Subjective Sight Testing.*

By LIONEL LAURANCE.

A Lecture before the American Optometric Association's Convention, New York.

Some judge of equalisation by the position of the near points—this is not so exact a test as those mentioned, and with young people it is particularly vague.

The monocular measure of the refraction obtained should now be recorded.

(8) The vertical muscular balance should be taken and recorded. Then the horizontal muscular balance is taken at 20 feet, and, simultaneously with it, that at the reading distance. For this purpose I prefer a multiple Maddox groove or rod employed with a large scale at 20 feet, and a small one at 16 inches. It is desirable to compare the distance and near balances under similar conditions, and this is not possible if different apparatus be used for each distance. The horizontal muscular balance whether orthophoric, esophoric or exophoric, and the degree is recorded.

This horizontal muscle test gives us most valuable information as to the lenses needed in a given case—whether the correction should be a full one or modified.

(3a, 4a, 5a) If, at the third step, hyperopia was proved absent and myopia present; should vision be less than 6/36, Cc. spherical lenses should be put up until V=6/36.

Should V=6/36, or if it is better than 6/36 without any spherical, the astigmatism should be sought, determined and corrected. If the astigmatism cannot be determined when V=6/36, the vision should be improved to 6/18 and the test repeated.

If the astigmatism cannot be determined when V=6/18, the vision should be further improved to 6/9.

If the astigmatism is high it will be capable of determination and correction when V=6/36, if it is of medium degree—say 1D. or so, it can be dealt with when V=6/18, but for low degrees vision must be improved to 6/9.

The treatment of the astigmatism is the same as in hyperopic cases.

Complete the measure of the myopia by increasing the power of the spherical lens employed for measuring the astigmatism.

It must be remembered that there is always the possibilty—almost the certainty—of accommodation being active for distance in myopia, with young people especially, if incorrect lenses have been previously used and, even if they have not, when there is astigmatism present. Cases of low myopia uncomplicated by astigmatism are rare, in the optometrist's consulting room, because they do not cause discomfort and distant vision is sufficiently good for all practical purposes.

(9) After the muscle test.

If there has been found a high degree say, .5 M.A. or 3△ of esophoria or exophoria, the binocular test should follow. This consists of adding binocularly a pair of weak + or − lenses to the monocular findings.

+ lenses are needed when there is esophoria and − lenses if there is exophoria.

In hyperopia with esophoria most probably higher + power will be accepted binocularly. The condition needs full correction of the manifest error.

In hyperopia with exophoria, reduction of the power of the + sphericals will be found most grateful. The conditions requires a modified correction, *i.e.*, less than full.

In myopia also the binocular addition of + power prevents still further any danger of overcorrecting the error, or again a change may be needed in oder to harmonise accommodation and convergence.

If the muscular balance is that of orthophoria, or of low esophoria with hyperopia, or low exophoria with myopia, as a rule this binocular test is not necessary.

The actual spherical lenses to be prescribed depends on the accommodative and the muscular actions, and to produce comfort, harmony, between the efforts of accommodation and convergence must be obtained, which is quite a different thing from equality of quantity of accommodation and convergence exerted. This comes into the subject of my third lecture and here it suffices to say that, with rare exceptions, comfortable near vision is of far more importance than sharp distance vision.

(10) Therefore the ability to read with comfort, with the proposed lenses, should be tried in all cases.

With young people—before the presbyopic age—any further change in Cx sphericals is rarely necessary but with Cc lenses it may very well be so, on account of defective accommodative action. If the age of the client is some-

*Concluded from page 15.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

where about when presbyopia commences, it is necessary to determine its presence or absence.

It is present if, with the distance lenses, ordinary type can be read better beyond the natural reading distance than at it. If present, the correction consists of that pair of + sphericals which causes ordinary types to be more clearly seen at the natural reading distance than either nearer or further away.

The presbyopic test and correction is essentially binocular.

(11) Finally, the frame has to be fitted or measured for. This part of our work is important, since faulty centration of lenses may counteract a great deal of the benefit that should be derived from them. It is impossible to centre lenses for all distances and positions of view, but we can adjust them for the position of the eyes when mainly used, and we must avoid throwing strain on inefficient muscles.

The modern tendency being to give large lenses, it is quite easy to have them badly decentered and, while this is of no great importance with very weak sphericals and cylindricals, it is of great importance with strong ones and especially with oblique cylindricals.

The Lens Selection.

It takes but a few minutes to measure the refractive conditions of the two eyes monocularly, much more time may be spent over the supplementary tests of equalisation, the muscle tests, and in deciding as to what lenses should be prescribed.

When the astigmatism is corrected we have removed one cause of asthenopia.

When the two eyes are equalised we have removed another cause of asthenopia.

These two can be treated with a fair degree of exactitude.

The third cause, which is due to inharmony between accommodation and convergence, is removed by the selected sphericals. This cannot be so accurately gauged and is more difficult to be sure of. The best test is the feeling of the subject and one thing we have to be careful about, and that is, not to give a correction that is too strong –it is far safer to err on the side of the sphericals being too weak than too strong—this applies as much to hyperopia as to myopia.

Lenses adapted to a pair of eyes should not be expected to last too long. Many people require changes regularly throughout life, all need some changes during life.

Adapted lenses should give comfort straight away and our clients should be trained to present themselves to be tested in the same way as they go, or should go, regularly to the dentist to find out whether the teeth need attention.

When I say that lenses prescribed should be comfortable straight away I know perfectly well that this is not always possible with nervous people who are, at first, intolerant of the use of new lenses, because they cannot at once break off old habits in connection with accommodation and convergence. Anyhow, we should try even if lenses have to be changed within a short time.

If during a test the degree of vision varies without a lens, or when some spherical is in front of the eye, it is a sure sign—the sign of spasm of accommodation or spasmodic accommodation. The chief cause of this condition is uncorrected astigmatism. The testing demands a little more patience; and the treatment consists of finding the cylindrical required and then fully correcting the manifest hyperopia, or considerably undercorrecting apparent myopia, and not giving any Cc. spherical at all if the myopia appears to be of low degree.

It is truly remarkable how spasmodic accommodation subsides, when the astigmatism has been corrected under suggestion, that is to say by simply telling the subject to read smaller types on the distance chart. If he says that he cannot, you merely tell him that he can and he does.

Classification.

We can classify the cases we get roughly, into four classes according to the degree of vision.

(*a*) Where vision is good *i.e.* 6/9 or better.

(*b*) Where vision is fairly good *i.e.* between 6/9 and 6/36.

(*c*) Where vision is below 6/36 but improved by + or – sphericals.

(*d*) Where vision is subnormal and not improved by + or – sphericals.

Let us take an example of a case of (*a*) which is the commonest condition.

The refractive condition is most probably hyperopia or hyperopic astigmatism although it may be low myopic astigmatism or low mixed astigmatism.

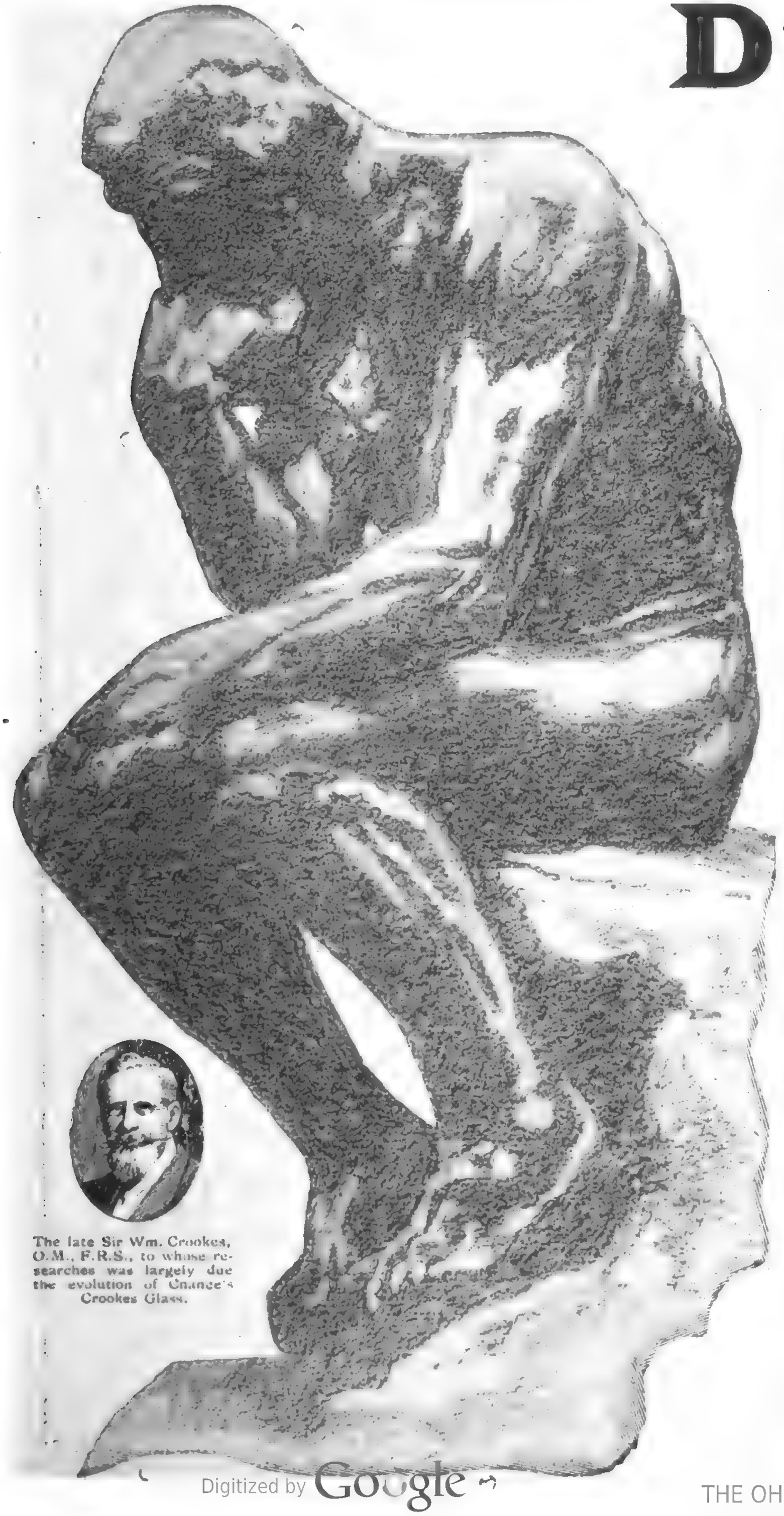
The left eye is occluded.

Before the right eye a +.5D. spherical is placed.

If it blurs vision, there is no manifest hyperopia, and a +.5 or +.75 is placed in the frame.

If it does not blur vision, there is manifest hyperopia, and the lens should be increased in power .75D.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



The late Sir Wm. Crookes, O.M., F.R.S., to whose researches was largely due the evolution of Chance's Crookes Glass.

Dumb.

Rodin's statue whispers of the mute struggle for expression which took place in men's souls when thought began to stir in the world. While man was yet dumb, he strove for speech, and from his struggles our present state has issued.

To communicate ideas is to stimulate thought and life. Without communication, nothing new can be told.

An instance.—Chance's "Crookes" Glass exists; but, for those who have not been told of it, might just as well be non-existent.

We can help you to tell your own public *what*

Chance's CROOKES Glass

is, and that *you* can show it to them. We have the blocks for special small-space advertising ready, can show them to you and will let you have them free. Many opticians have widely increased their clientele in this way.

CHANCE BROS. & Co., Ltd.,

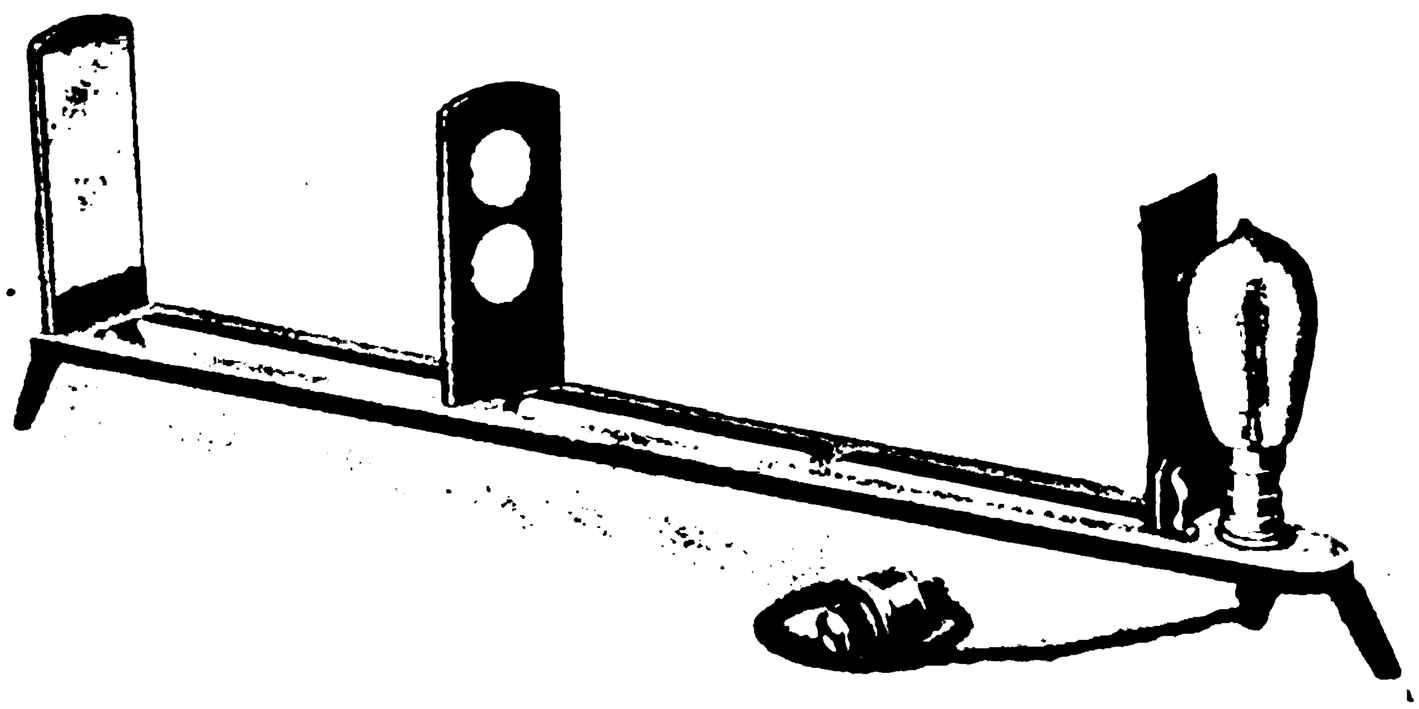
Glass Works, Smethwick.

An instrument is now on the market to demonstrate to the public the efficacy of Chance's "Crookes" Glass in cutting off the harmful light rays.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The "RAPID" Curved Lens Demonstrator

Patent No. 112074



A MOST CONVINCING DEMONSTRATION OF THE ADVANTAGES GAINED BY USING TORIC OR MENISCUS LENSES IN THE PLACE OF BICONVEX OR BICONCAVE.

Particulars and Price on Application.

GEORGE CULVER LTD.,

Manufacturing Opticians,

PENTONVILLE, N.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

In all these cases vision should be fogged to 6/9 or 6/12.

Employ the fan for determining astigmatism.

If there is no astigmatism – find the strongest + spherical giving the best visual acuity.

The Revolving Chart.

If astigmatism is determined and the principal meridians roughly by an astigmatic fan, proceed to locate the principal meridians precisely by some form of revolving astigmatic chart.

Find the Cc. cylindrical to equalise the two sets of lines—always going to the reversal of their clearness.

Complete the spherical test.

Test the left eye similarly.

Make the muscle test.

Make the binocular test if necessary.

Note the effects of the lenses in near vision.

Ultimately if the + spherical is stronger than the – cylindrical there is compound hyperopic astigmatism.

If the + spherical is numerically equal to the – cylindrical there is simple hyperopic astigmatism.

If the + spherical is weaker than the – cylindrical there is mixed astigmatism.

If there is no + spherical there is simple myopic astigmatism.

As an example of case of (*b*)

V=6/9 to 6/36.

Commence with a +1D. lens.

If it improves vision there is absolute hyperopia.

The + spherical is rapidly increased until vision becomes blurred again.

If anything near to V=6/6 is not attained with a + spherical, it is because there is high astigmatism.

Fog the sight say, 2 lines of the chart from the best obtainable vision.

Test for astigmatism.

If the Cc. cylindrical required is strong—it may be advisable to increase the + spherical power before completing the astigmatic test. This will occur if there is high astigmatism.

If the first + spherical does not blur vision, but no + spherical improves it, find the + spherical that blurs the sight a little and then proceed as before, the case is one of mixed astigmatism.

If the first + spherical blurs and a Cc. improves the sight more or less, the case is one of myopia, or myopic astigmatism, simple or compound.

Proceed then to the astigmatic test at once without any spherical.

If there is high astigmatism and little or no myopia the astigmatism will be determinable at this stage and must be corrected.

If the astigmatism is of medium degree say, 1D. to 1.5D., and there is myopia of about the same amount, the astigmatism cannot easily be determined when V=6/36; the vision then must be improved to 6/18 before the astigmatism can be treated. Again, if the myopia is higher and the astigmatism lower the vision must be improved to 6/9 before the astigmatism can be determined and measured.

For improving vision from 6/36 to 6/18 about –1D. spherical is required and from 6/18 to 6/9 about –.5D.

When the astigmatism has been corrected, the spherical test has to be completed by reducing the power of a Cx. fogging spherical lens or increasing the power of a Cc spherical; or it may possibly be necessary to increase the power of the Cx spherical, if there is mixed astigmatism.

Although the spherical lenses differ there is actually no real difference in the procedure for testing the various condition of refraction met with. What is to be aimed is to correct the astigmatism when both focal lines are in front of the retina, so as to eliminate the factor of accommodation, so far as is possible. Then, when the astigmatism has been corrected, to measure the axial error of hyperopia or myopia by finding the strongest + or weakest – spherical that gives best vision.

Complementary Tests.

The spherical test being completed the various complementary tests follow as described.

I make a difference between those cases where V=6/36 or even 6/60 and those in which vision is more subnormal because if No. 60 or 36 be legible, some of the lines of the astigmatic fan must be distinguishable also, whereas if vision is less than 6/60, the lines are not distinguishable as such.

To illustrate a case of (*c*) in which vision less than 6/36.

The condition may be hyperopic, myopic, or mixed.

Apply a +2D. spherical—if there is hyperopia it will most probably improve vision appreciably; if it does do so apply stronger ones until the best visual results are obtained, then fog and proceed as in similar cases described under class (*b*).

If a Cc. spherical is required, improve vision to 6/36 and no more, and then proceed as in the myopic cases of class (*b*).

Sometimes, of course, quite strong lenses have to be applied before any definite improve-

Digitized by Google Original from THE OHIO STATE UNIVERSITY

ment in vision results, especially in the myopic cases—very high hyperopia is rare.

If there is hyperopia, and vision is improved by sphericals, and the subject is old so that accommodation for distance can play no part, it is sometimes better to treat the case as if it were myopic, that is—find the weakest convex spherical that give best vision, correct the astigmatism with convex cylindricals and afterwards increase or reduce the power of the Cx spherical if, and as may be, needed.

The Fan Test.

If sphericals fail to improve the sight at all, or if their effects are indefinite, it is because the spherical, while improving the condition for the one principal meridian, makes it worse for the other. This occurs in cases of simple hyperopic or myopic astigmatism or compound with the astigmatism quite high compared with the general error. In these cases the fan usually demonstrates astigmatism at once. If it does not a weak + or − spherical will usually sharpen up some of the lines, so that the principal meridians are indicated and the test is completed as in other cases. The axis of the cylindrical, whether Cx. or Cc. being placed in a direction at right angles to the clear fan line.

A case of mixed astigmatism, with the one meridian much more defective than the other, would be treated in the same way.

If there is mixed astigmatism with both errors approximately equal, find the strongest + spherical with which some one fan line is clear. This is approximately the power needed, for the hyperopic meridian. The astigmatism is then measured and corrected by a Cc. cylindrical whose axis is at right angles to the fan line seen clearly. In these cases change in the cylindrical, as the test progresses, often necessitates changes in the spherical.

The stenopaic slit is quite useful in some of these cases.

A retinal confusion disc is large in direct proportion to the degree of optical error, and further, for a given error, it is larger as the pupil is larger.

A pin-hole disc improves defective sight, due to an optical error, by reducing the effective size of the pupil. The retinal confusion disc, due to astigmatism, is a line or ellipse, whose long direction corresponds usually to the meridian of greater error. If the slit is in front of the eye, the vision is best when its long direction is in the meridian of lesser ametropia. This occurs because the short diameter of the slit, in the meridian of greater error, has reduced the effective diameter of the pupil in that meridian, and so lessened the length of the retinal confusion disc in the same way as the pin-hole reduces it in all meridians. (Two stenopaic slits, at right angles to each other, constitute a pin-hole aperture).

When this occurs, the spherical error, in the meridian of the aperture can be tested and corrected independently of the other, and by turning the slit through 90°, the other principal meridian can be similarly treated.

The general routine of subjective sight-testing, as outlined, serves for the ordinary cases. It breaks down when we have high anisometropia, antimetropia and amblyopia. The treatment of these require patience and judgement.

There is no such thing as an exact correction by lenses of an optical defect, because the lens does not become an integral part of the eye. Even if it were exact, for some one distance, it would not be so for others, and it cannot be so for all lines of view, as the eyes converge, accommodate, and wander about.

Every correction is a compromise more or less, and every case is special to itself, but notwithstanding possible deficiences in our work we do aid the nation's sight and we know, further, that the lenses we give have beneficial effects beyond those shown in the eyes themselves.

New Companies.

Charles Fer and Co., Ltd.—Private Company. Capital, £100 in £1 shares. To carry on the business of manufacturers of and dealers in surveying, mathematical and scientific instruments and appliance, electricians, mechanical engineers, etc. The first directors are: C. and P. Fer, 42, Newgate Street, E.C. Qualification, 10 shares. Solicitors: E. B. Gee and Co., 15, Copthall Avenue, E.C.

D. T. Evans, Ltd.—Private Company. Capital, £25,000 in £1 shares (12,500 8 per cent. cum. preferred). To take over the business of a wholesale and retail dispensing and analytical chemist, optician and photographer, carried on by D. T. Evans, at various addresses in Margate, Cliftonville, Westgate-on-Sea, Ramsgate, Broadstairs and Birchington, as "D. T. Evans, Dispensing Chemists." The first directors are: D. T. Evans (sole permanent governing director and chairman), Mrs. D. C. Evans, R. Clacket and A. E. Button. Qualification 100 shares. Remuneration as fixed by the company. Solicitors: Neve, Beck and Kirby, 21, Lime Street, E.C.

Matter intended for the current weeks' "Optician" must reach this office on the Tuesday morning preceding publication,

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Protection for the British Optical Industry—and British Science.

Some views of Leading Mathematical Instrument Makers.

Mr. Lyndon R. Bircumshaw (of Messrs. W. and J. George, Ltd.), wrote as follows in the 'Westminster Gazette,' of the 23rd ulto.:—

"On Wednesday last the 'Westminster Gazette' published an article headed 'A Blow to Science,' by Prof. Armstrong, of the City and Guilds Institute. This article is evidently in protest against the 'Safeguarding of Industries Bill,' providing for a duty on certain scientific goods which are at present being imported from Germany, and which, owing to the depreciated value of the mark, are being sold below the price at which they can be produced in this country.

"The writer of this article is evidently under the impression that the British scientific apparatus manufacturer is asking for the exclusion of certain German scientific instruments which he considers superior to those of British manufacture, or which cannot be produced at all in this country. If this were the true position, then by all means let us have free importation of these articles, which are essential for the teaching of science in this country.

"The British manufacturer can produce a better article than the German; he can produce it at a lower figure, but he cannot afford to sell it at the same price, because twenty shillings cost him one pound, and twenty marks can be bought for 1s. 4d. It is simply a matter of the exchange rate, which to-day gives the German an unfair advantage, and the British manufacturer will not need any protection once this exchange is stabilised. We have nothing to fear from German competition in the manufacture of scientific apparatus, and very little learn from them. Even in the old days before the war we showed them how to make the instruments for which they held the monopoly.

"Many of the Continental models which are so well-known to-day are the result of British brains, and were designed from British ideas. Why were not these instruments manufactured here, instead of submitting to the German manufacturer sketches and working dimensions when we required an apparatus which had been thought out and evolved for the advancement of science in this country? Was it lack of enterprise or lack of support by the Government? The German manufacturer is backed by his Government, is supported by extensive propaganda work, which provides him with free advertisements all over the world, and he is encouraged to 'beat the world.' There is no doubt he would have done, had we slept much longer. The old order has changed, and the Britisher is to-day making the instruments which he thought out and designed for the Germans years ago.

"A few days ago you devoted two columns of your paper to an account of 'Prosperous Germany.' They are ever alert to seize an opportunity, and this opportunity is given them to-day by the depreciated value of the mark. They can increase their prices 1,300 per cent. and still sell to us at pre-war prices, because the mark is now only 1/11th its pre-war value. This gives to them the opportunity of flooding the market with cheap goods, many cheap in quality as well as price. Once again they are out to capture the trade of the world. In the old days they would sell below cost until the British manufacturer was 'down and out,' then, when they had killed all competition, the prices would begin to soar above our figure; but the home manufacturer had lost his connection, and had given up the manufacture of this particular article, which he could not afford to sell at the German figure.

"To-day, owing to the rate of exchange, Germany can get the trade without selling below cost, and until this rate is back to normal we must protect key industries, one of the most essential being the manufacture of scientific instruments.

"During the war the British scientific instrument manufacturer was encouraged, we might say compelled, to make scientific apparatus which had previously been supplied by Germany, but which it was essential we should now have for our scientists to prosecute their research work on munitions. Without these scientific appliances, it would have been impossible to have designed and tested the instruments of warfare which contributed to our success. His manufacturing resources were placed at the disposal of the Government, his experience, patterns, models, and business secrets were freely given in the service of the nation. His factory was controlled, he was given P1 certificates to enable him to obtain

Digitized by Google Original from THE OHIO STATE UNIVERSITY

his materials, and he was asked to design and make instruments for which we then had no source of supply.

"This meant considerable expense and interference with his general business, new plant had to be laid down, special machinery and tools had to be designed, and much experimental work had to be done. Almost unsurmountable difficulties were overcome until practically every type of laboratory appliance was being successfully made in this country, and to-day we are independent of German supplies.

"Is all this machinery to be scrapped, all the work to be wasted, simply because, owing to the temporary depreciation of the mark, Germany is at present able to produce at a lower cost? This is the time when the Government must step in and give the British manufacturer a fair chance and fair play. They are pledged to do it, they encouraged us to start new industries, and they are bound to see that these industries do not go back to Germany.

"The position is incorrectly stated by Prof. Armstrong. He says that the educational institutions and teachers of science have to procure their apparatus from abroad owing to the inferior quality of the British article, or to the fact that it is unobtainable in this country, or because the price is prohibitive compared with the German price.

The British Made Balance.

"His first instance is the 'Precision Balance,' which he states cannot be obtained in this country at a moderate price. We are to-day making in Birmingham a short-beam balance capable of weighing to one-ten-thousandth part of a gram, and this is being sold retail at about 50 per cent. increase on the pre-war price of a German balance of similar quality. It met with universal approbation by many well-known leaders of science when exhibited at the recent British Industries Fair, and is in use in several of the Universities and educational institutions in this country. We should be pleased to submit it for a comparative test by the National Physical Laboratory with any continental balance which can be bought to-day at the same price, and will be pleased to furnish testimonials from leading authorities as to its accuracy and suitability for general use.

"His next assertion is that 'good porcelain which can be safely used is not made here.' The Royal Worcester or Doulton porcelain can be obtained in all the patterns for laboratory use, and will compare favourably with any porcelain turned out by the Berlin factories.

"As regards glassware, there is a firm in Scotland and another at Barnsley which supply all kinds of furnace-made glassware of undeniably good quality. The combustion glass made by these firms is in every way equal to the well-known Jena and Kavalier brands.

"Lamp-blown and graduated glassware of excellent quality can be obtained from any of the laboratory suppliers, and at a recent test by the National Physical Laboratory several pieces of graduated apparatus selected at random from various manufacturers' stock gave better results under test than similar articles of German origin.

"As regards the polariscope, which Prof. Armstrong states has never been procurable here, we shall be pleased to supply him with a dozen of these instruments, which have been made throughout in Birmingham within the last three months."

Comments by Mr. Alexander Hughes.

Mr. Hughes, of 39, Fenchurch Street, E.C., wrote to our contemporary under date August 24th, as follows:—

"I have read Mr. Bircumshaw's letter in your issue of the 23rd inst., in which he makes certain definite and circumstantial statements about British articles and instruments produced at economic prices. I have just read Prof. Armstrong's letter in to-day's issue; and I am surprised that a gentleman of his standing should so offensively attack and run down British manufacturers at a time when they, under great difficulties, are striving to develop their industry and increase employment for British men and women, and go out of his way to tell us "not to under-rate German intelligence and the faculty the nation has of using it." It is inopportune and uncalled for; no one has attacked German intelligence.

"The vital thing is to support, develop, and increase what is essentially a British industry.

"The least Prof. Armstrong could have done —especially when he asks for a fair field and no favour—is to grant the same to the manufacturer, and before writing as he has done to have made it his business to examine the instruments, or, in his own language 'taste the puddings.'

"Good British Instrument Puddings are being made, and if he will help to stir them better, or can impart a better flavour or appearance to them, such help will be gratefully welcomed, and the hungry world will, like Oliver Twist, be coming for another helping. Thus the export trade will be increased, which is so essential to us a nation.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

NEWBOLD & Co.'s Specialties Nos. 1 & 2

NON-CORRODIBLE—SILVER WHITE METAL.
Excellent in Finish.
Wears Well Always.
Built on Correct Lines.
OH! IT'S A BEAUTY.
Light Effect Semi-Flat Rims.
Looks Almost Rimless.
Order Your Stock NOW.
You will Not Regret It.

550

Is Its Number.

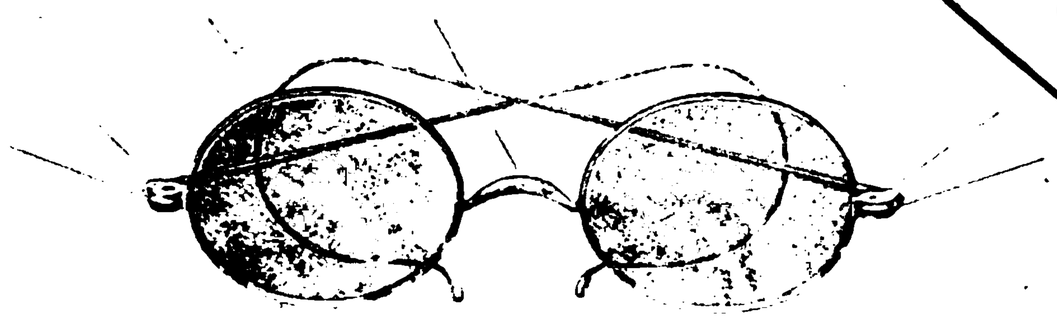
Sizes 00, 0, 1 & 2 and Round Eye 40 m/m all Measurements.

A Frame that will stand on its merits with all competitors. It will fill the bill where the best qualities are demanded.

THE SPECTACLE.

NEWBOLLOY No. 550.

The lines all point to special features in construction



The "Carlton" Case

PAT. No. 14064.

THE RIGID CASE WITH A FLEXIBLE GUSSET.

A CASE FOR SHELL SPECTACLE WEAR WHICH CAN BE CARRIED IN THE POCKET.

Affords Ample Protection to the Spectacle and Fits Snugly.
Eliminates the Annoying Rattle so often noticed with All-Hard Cases.
When Glasses Worn the "CARLTON" Lays Flat in the Pocket.
The "CARLTON" will act the Salesman to the Shell Spectacle.
A supply of these Cases will Help your Sales in the coming Season.
A CHOICE RANGE OF LEATHERS **IN STOCK.**

SHOW CARDS AVAILABLE

NEWBOLD & Co., **72 & 74, GRAY'S INN ROAD, LONDON, W.C.1**

(P. & S. NEWBOLD.)

Telegrams—OMNEWBOLZA HOLB. LONDON. TELEPHONE—CITY 1642.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

QUALITY FIRST

THERE IS NOTHING BETTER THAN

D. Y O. Co.'s

1921 Model Finger Piece Mounting

Guaranteed 1/10th-12ct.

Style and finish perfect in every respect.

Ask for, and insist on getting

DUPAUL, YOUNG OPTICAL

Co.'s Spectacleware.

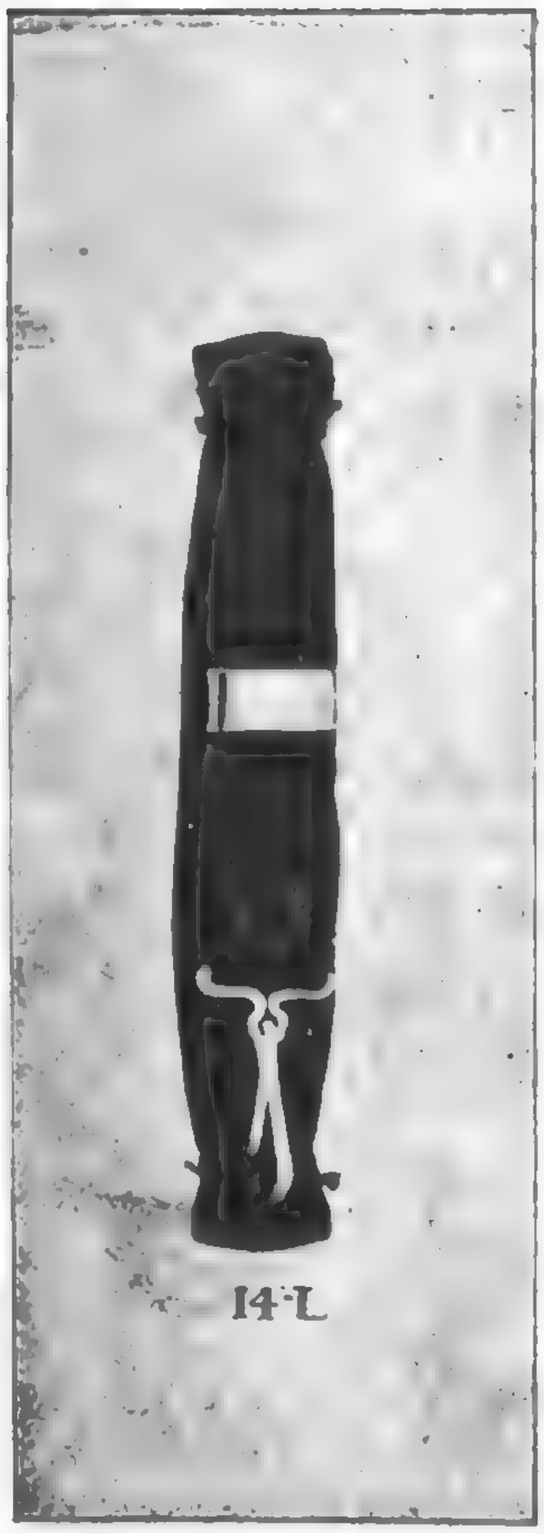
To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. Telephone: CENTRAL 7241

Digitized by Google Original from THE OHIO STATE UNIVERSITY

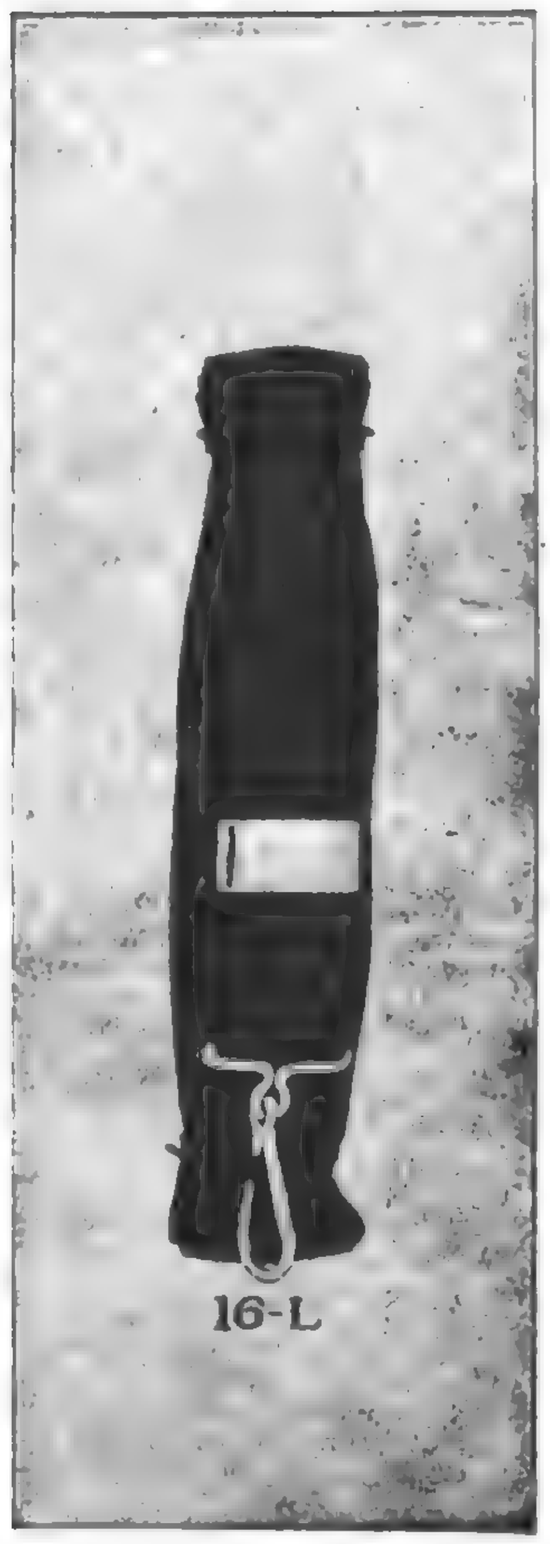
"BISHOP QUALITY"



SILK EYEGLASS CORDS AND MONOCLE RIBBONS.

With Gold Filled, Silver or Gun Metal snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.



THE BISHOP COMPANY,
North Attleboro, Mass., U.S.A.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Shur-on Glasses

Merit

The merit of any product is best proven by the service it renders.

The service record of Shur-on Optical Products dates back to 1864—and is favourably known the world over.

For upwards of half a century the name "Shur-on" has been synonymous with "Quality Beyond Question." The design, construction and workmanship of Shur-on spectacles, eyeglasses, mountings and cases bear the mark of the master craftsman. You will find them a most worthy and profitable addition to your present line. Your wholesaler can supply your needs.

Quality Beyond Question Since 1864

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"As a member of the instrument industry, to which I have devoted some fifty-five years of my life, and as a member of the Council of the British Optical Instrument Makers' Association, I may claim to have some knowledge of what has been done and is being done, and when I know how our industry rose to the tremendous needs of the war, and within three years increased the production fifteen to twenty times, we surely can claim something for *British* intelligence and the faculty of using it.

"We have in our ranks some of the leading opticians of the day, and when in America recently I was most gratified at the expressions of high esteem in which they are held.

"Let the men of science, the medical and other professions, give us helpful criticism of our instruments, and also of our prices, but let all strike the keynote of British instruments and apparatus.

"As for the Key Industries Bill, there is a legitimate and national necessity for it, which, as a life-long Liberal and Free Trader, I regret.

"I am amazed at the ignorance on the subject of instruments shown by the speeches of many members, and think we owe a great deal to Sir Philip Magnus for his clear and sound work in support of the Bill."

The National Association of Opticians.

INCREASE OF MEMBERSHIP.

The Annual General Meeting of the N.A.O. was held on the 9th of August, in the Royal Technical College, Glasgow. There was a fairly good attendance of members. The President, Mr. A. Hershberg, occupied the chair. Letters of apology for inability to attend were received from the Hon. Treasurer, Mr. H. W. Daykin and Mr. T. Beardsall. With these two exceptions all the members of the Council were present.

The Chairman in a few introductory remarks opened the meeting, warmly welcoming those present, and expressing his pleasure in being afforded the opportunity of again visiting the great commercial city of Glasgow.

The reading of the minutes of the 1920 Annual Meeting and of the Special General Meeting of March 30th, 1921 (called to consider the revised Rules) was the first business item, and these on being put to the meeting were duly confirmed.

The Seventh Annual Report (of which copies, as well as of the Balance Sheet, had been forwarded to all members prior to the meeting) was then read. This Report, which covered a period of about nine months, touched upon the unsettled and dangerous economic condition of the Empire, prevailing during these months, which had had a disastrous effect on the businesses of many ophthalmic opticians, and so nullified to some extent the activities of the Council for the progress of the N.A.O. particularly as regards membership. However, notwithstanding this adverse condition, 77 new members had been added to the roll of membership—the largest number yet elected within a similar period of time.

Expression was given to the Council's anticipation of much greater activity and progress in the future, now that the saner elements of the nation are in the ascendent, and the Report concluded by expressing the Council's thanks to the Hon. Local Secretaries and members generally for their help and support, which the Council had done their utmost to merit by the efforts put forth for the welfare of the members, and the progress of the Association as a body, to do its part in raising the status of the ophthalmic profession.

The Chairman, in moving the adoption of the Report, commented at some length on the work accomplished by the Council since the last Annual Meeting, and hoped that this report would be the last in which it would be necessary to refer to that terrible catastrophe, the late war, which we all wished to forget. Continuing, the Chairman said the record of the Council's work during the last nine months was proof that the N.A.O. was not asleep, and had done what they could on behalf of the members, and the ophthalmic profession generally. He specially emphasised the importance of putting into practice as soon as opportunity served, the calling of a conference of Hon. Local Secretaries; the formation of a London Branch of the N.A.O.; and the institution by the N.A.O. of examinations for ophthalmic opticians, and providing instruction for same, which as stated in the Report, the Council had already discussed. In conclusion, after referring to the donation of two guineas by the Association to that deserving institution, St. Dunstan's, and the indebtedness of the N.A.O. to Mr. J. W. Watkinson,

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

of Walkden, for his kindness in again acting as Auditor, the Chairman moved that a letter of thanks be forwarded to Mr. A. Wood, of West Hartlepool, in recognition of his valuable services while on the Council, to which he had been elected in 1915, and from which he had now resigned. This was carried unanimously, and the motion that the Report be adopted was seconded by Mr. J. W. S. Green.

Before putting the Report to the meeting for adoption, the Chairman invited the comments of any of the members present.

Mr. J. G. Barr, of Moffat, asked for some further information regarding the proposed examination scheme and how it would affect the present members of the N.A.O. The Chairman, after replying to this member, in the absence of further questions, put the report to the meeting, when it was unanimously carried.

The Balance Sheet, which afforded proof of the Association's sound progressive position, was proposed for adoption by Mr. J. A. Brackenridge, seconded by Mr. W. Devine both of Glasgow—and carried unanimously on being put to the meeting.

Elections.

The Scrutineers having now finished counting the votes for the election of four councillors, the Chairman announced the results as follows:—Messrs. E. Moevius, L. Moreton Parry, H. W. Daykin and C. Adams. The best thanks of the meeting were accorded to the Scrutineers, Messrs. Fred Hill and John Selkirk, for their services, on the proposition of the Chairman, seconded by Mr. Parry.

Mr. J. W. Watkinson, of Walkden, was re-elected Auditor for the ensuing year, on the proposition of the Chairman, seconded by Mr. R. Chalmers.

The next business was the consideration of the following resolution of the Council:—"(*a*) That the Council recommends to the members of the N.A.O. the desirability of instituting an examination scheme for opticians; and (*b*) that it further recommends that arrangements be entered into for providing a suitable course of instruction at an approved Institution."

Mr. T. S. Baird of Glasgow, responding to the Chairman's invitation to express his opinions, dwelt on the advantages that would accrue to their Association, and the benefit to members individually, if the resolution of the Council were adopted by that meeting. It would be possible to hold examinations in different centres, and so students would avoid the expense and loss of time incurred by having to travel to London, as at present.

Mr. L. Moreton Parry, in moving the adoption of clause (*a*) of the resolution, remarked the Association was hampered by not having an examination scheme in connection with it, although he thought examinations as a rule were a poor test of real knowledge. However, a course of study in practical and visual optics was necessary, but the Council did not contemplate instituting a complicated examination scheme. On being seconded by Mr. R. M. Stark, of Glasgow, this clause was carried unanimously.

Clause (*b*) was then considered, and Mr. Parry suggested that the word "may" be inserted between the words "arrangements" and "be." On being seconded by Mr. Dunn, of Glasgow, clause (*b*) as amended was carried unanimously.

The last business to be considered was where should the next Annual Meeting be held. Mr. J. W. S. Green proposed that it be held in London. On being seconded by Mr. T. S. Baird, this was carried unanimously.

Votes of thanks were passed to the retiring President, Treasurer and Secretary, and suitably responded to.

The Chairman proposed a hearty vote of thanks to Mr. T. S. Baird for the trouble he had gone to in making the arrangements for the Annual Meeting. This was seconded by the Secretary, and carried unanimously. A vote of thanks to the Chair terminated the proceedings.

A Simple Portable Reflectometer.

For some time the U.S. Bureau of Standards has been engaged in the development of a simple portable reflectometer. Recently numerous improvements have been made in this device which in its present form may be described as follows: The instrument is a sphere with a small segment cut away leaving a hole over which the surface to be tested is placed. The wall of the sphere is viewed through a small hole by means of a portable photometer, the spot viewed being screened from the test surface. A lighting tube set at an angle to the sphere surface is arranged to rotate about an axis normal to the surface of the sphere so that the direct light can be thrown on the test surface or on the sphere wall. The theory of the integrating sphere shows that the reflexion factor of the test surface is simply the ratio of the photometer readings in the two cases, no assumption being made as to the way in which the light is reflected from the test surface. Moreover, the reflexion factor measured is not affected by selective reflexion from the sphere

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Make Arrangements for handling Increased Business.

UNDOUBTEDLY more business for all of us lies ahead—it depends upon our foresight to make arrangements for handling it NOW.

Associate with the **L.O.C.** at once so that you can make a trial of our Service in comparatively quiet times. Then when the rush comes you will either have perfect faith in our ability to meet your requirements or your work will be going elsewhere.

We offer you a uniform standard of work and high quality in the mechanical interpretation of your requirements. Attention to your instructions is immediate—insuring speedy delivery, and charges made are as moderate as organisation expenses will allow.

Cold print altogether fails to justify the live virile force you engage on your behalf when you allow us to co-operate with you. A trial will convince you that it is a definite step towards bigger and better business.

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rueide la Pepiniere, Paris. France.

Also at—2, Str-Bureei, Bucharest, Roumania.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

CROOKES' ULTIMATE

1913 — 1917 — 1920

A and B M Ultimate

The last months of the late Professor Sir William Crookes, O.M., F.R.S., were devoted to perfecting an Antiglare glass—the ultimate end of long years of research. That excellent protectorative known as Crookes' A *marked the first stage only* in that renowned scientist's eye preservative glass work—in the year 1913. In 1917 Sir William brought out his valuable M series, and his remaining years' work culminated in his ultimate or 1920 series. It will in future be known as the Crookes' U series and ranges from the almost colourless Ua to the very dense Uf. Crookes' U glass runs thus:—

Crookes' Ua - a delightful, very faintly bluish tinged, **almost** colourless glass eminently suitable for general wear. Although a true antiglare glass in the same sense as Crookes' A it permits the passage of a greater amount of the visible rays—*a distinct advance on 1913.*

Crookes' Ub - an extraordinarily restful glass to be used when the eyes resent too much light; especially comforting when protracted use of the eyes by strong electric light is unavoidable.

Crookes' Uc - is by far the best glass for brilliant sunshine or excessive glare, whether from damp road, sea, or setting sun.

Crookes' Ud - is **THE** glass for tropical use.

Crookes' Ue - is the same as Crookes' Ud but a trifle darker; excellent for snow field.

Crookes' Uf - specially intended for the fiercest light or flare conditions, and for workers by acetylene, oxyhydrogen, or electric welding, iron rolling mills, etc., etc.

For further particulars write to—

The Secretary, **SIR WILLIAM CROOKES' ULTIMATE ANTI-GLARE GLASS CO., LTD.,**

30, Wigmore Street, Cavendish Square, W. 1

F. PARKER WOOD,

Wholesale Manufacturing Optician,

47, MARK LANE, E.C.3

Immediate delivery from stock:

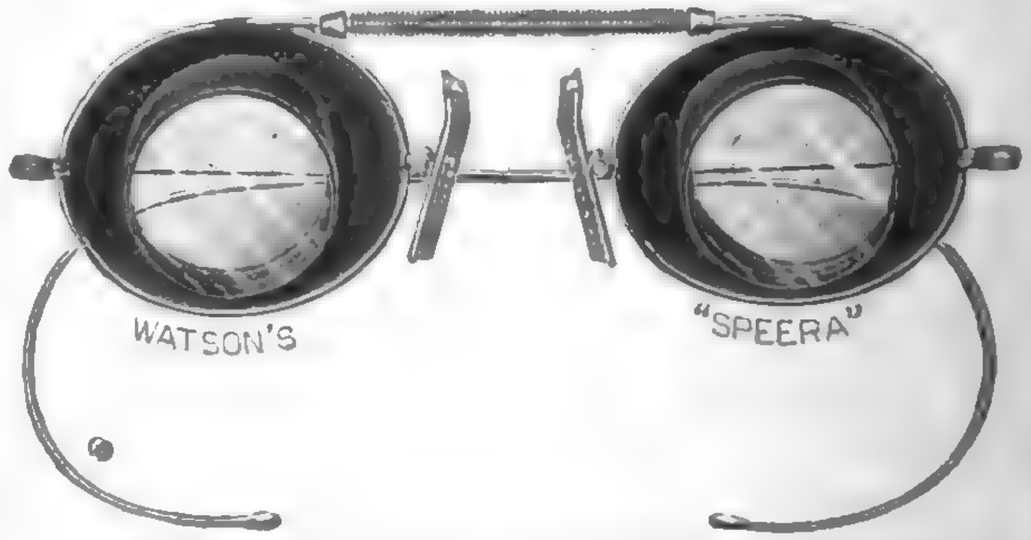
TELESCOPES
FIELD GLASSES
PRISM GLASSES
MICROSCOPES
ANEROIDS & CLOCKS
BAROGRAPHS
SEXTANTS
BINNACLES
COMPASSES

CHRONOMETERS, New & Second-hand

Repairs a Speciality.
Clinicals and all other Thermometers.

PARALLEL GLASSES of every description.

WATSON'S "SPEERA" BINOCULAR MAGNIFIERS.



A pair of ACHROMATIC lenses are mounted in a spectacle frame, which may have either an adjustable spring bridge, or an ordinary saddle. For the best effect to be obtained, the eye-centres must be accurately specified, and if saddle bridge is used, it must be made of the proper height and shape. The necessity for these precautions will be appreciated when it is known that the lenses have to be set in the frame at a slight angle, so that they both converge precisely on the focal point. The variety of uses to which this Magnifier can be put will ensure a large sale.

It is proposed that names shall be kept of opticians willing to supply them, and applicants will be referred to their local opticians for measurements.

Watson's will be pleased to hear from opticians, who would interest themselves.

Full particulars from:—

W. WATSON & SONS, Ltd.,

313, High Holborn, London, W.C. 1

Works—Bells Hill, High Barnet. **Established 1837**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

walls. No accurate voltage adjustment of the lamps in the photometer and the reflectometer is necessary as both operate from the same battery. The use of a low-voltage flashlight lamp in the lighting tube makes the instrument very portable and convenient. By addition of an exterior light source, the same instrument can be used to measure transmission factors of clear or diffusing media.

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

Eye Affections in Colombo.

Sir,—Your issue of June 10th last contains an article by Mr. H. F. Sparling upon "Pterygium; its diagnosis and treatment" which especially interested me.

I have been engaged in refraction work in Ceylon for two years. I am the only qualified optician in the colony and, if the remark is not invidious, I think my practice is the most extensive. My clientêle consists of Europeans and the educated Sinhalese or Cingalese.

Pterygium is very common among Sinhalese, and perhaps a few observations from my experience would not be uninteresting.

Generally the disease is most marked; and is regarded with little concern by the patient so long as his vision is not restricted. So pronounced is the growth in some cases that the contact which normally exists between the lower lid and the globe ceases to exist—especially towards the inner carthus. It is not surprising, therefore, that the patient complains of "tearing in the eyes," since the system of drainage has been interfered with and the tears run down the cheek. The sclerotic, I have noticed, looks yellow and unhealthy.

Many pterygium cases are also diabetic subjects. Diabetes is common in the East—a condition attributed to the rice diet. It would be interesting to know if any connection exists between these two maladies and whether perhaps treatment of the pterygium along medical lines (apart from surgical) lies this way. Surgical treatment, as described by Mr. H. F. Sparling, seems to be little practised in Ceylon, and of the many cases I have seen, I have never seen or heard of one so treated. Many victims to this annoying affliction would be gratified to learn that operative treatment is possible—if not in Ceylon.

ARTHUR S. LEATHER.
P.O. Box 23, Colombo.

A Message from Toronto.

Sir,—After a delightful sea voyage, I am back in Canada, and am still mindful of my recent visit to England, and of the many courtesies shown me, which helped me so much in my business.

With your kind permission, I should like, through your very excellent publication, to thank those in the optical trade with whom I had the pleasure of coming into contact, for the attention and consideration shown me.

At the same time, I wish to express my gratification with the results obtained from our advertising in your Journal, which I consider an excellent advertising medium for the optical trade in the British Empire.

PERCY HERMANT,
President and General Manager.
Imperial Optical Co., Toronto.

A Doubtful Case.

Sir,—Permit me to thank your two correspondents who kindly replied to my letter published in your issue of August 12th. In answer to "T.H.S.," the age of my customer is 39. The prisms have been given for relief of exophoria; but there is no difficulty in obtaining single binocular vision without any glasses. The great trouble is the headache, evidently resulting from eyestrain, which these prisms are intended to relieve, and accomplish their purpose with but partial success. The prism exercise described by "Constant Reader" was ordered by the oculist, and has been practised without lasting benefit. Further I should add that, since writing before, I find my customer has worn glasses prior to those mentioned in my letter. I have before me the prescription for her first (reading) glasses, which is as follows:

R. + .5 sph. ⊃ + .5 cyl. ax. 85°.

L. + .5 sph. ⊃ + .5 cyl. ax. 120°.

What puzzles me is the difference between the cylinder axes, prescribed by two oculists. I confess that I myself feel uncertain about the exact axes for the cylindrical correction,

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

and would be glad to know if there is any ground for supposing that the axes may vary from time to time.

A New Reader.

Decentering.

Sir,—I wonder if any of your readers could explain the formula for working out the decentration in mms. necessary in any given lens, for any given prism or prismatic effect?

12 Years' Reader.

*** The formula for prismatic effect, expressed in prism diopters is $\Delta = D\ C$, in which D is the dioptric power of the lenses and C the amount of decentration in centimeters. This matter is fully explained in the various text-books dealing with ophthalmic optics. The best is Laurance's "General and Practical Optics" (3rd edition, 1920).

Willmotts Ltd. Social Club Outing.

On Saturday, 27th August, a very successful trip to Weston-super-Mare was conducted by the Social Club of Willmott's Ltd., Optical Case Manufacturers, Evesham. About 80 members left Evesham at 8 a.m., in special coaches on the Great Western Railway, and arrived at Weston at 11.0. The weather was very favourable and all spent a most enjoyable time among the varied attractions of the popular resort. The party left Weston at 8 p.m. and reached Evesham at 11.30.

Amblyopia ex Abusu.

This clinical entity owes its existence largely to the fact that its victims are almost always addicts of both alcohol and tobacco. The patient complains of inability to "see off." Paradoxically he sees better when illumination is poor, often best at twilight. Thus his visual disturbances have a hemeralopic component. In cases with central scotoma this improvement at twilight is not paradoxical, for the coming of sundown causes pupillary dilatation just as the noon sun causes miosis. There is a curious inability to tell the colours of small objects, especially when green or red is concerned. The victim also makes mistakes in changing coins. Often these visual troubles are associated with psychic alterations, so that confusion may arise in the mind of the medical man. Ophthalmoscopic finds are usually negative, although there may be a paling out of the optic disc. Naturally (says the 'Medical Record'), we have to exclude the possibility of methyl alcohol poisoning, and the ophthalmoscope enables us to make this distinction since the latter intoxication is attended by rapidly supervening atrophy of the optic nerve. Of prime diagnostic and therapeutic value in amblyopia ax abusu, is abstinence from alcohol and tobacco, which is usually followed by prompt return of normal vision. The tee-totalist Turk suffers from simple tobacco amblyopia. Generally speaking, alcohol amblyopia occurs often when least suspected. The author of this note, has seen cases in drinkers of both Cologne water and tooth washes who were presumably "abstainers." In fact, pure alcoholic amblyopia (without coincident tobacco addiction) is apt to occur in the secret or innocent drinker, as in the case of a youth whose fond aunt stuffed him with wines and dainties. In such cases the odour of the breath may be decisive. Curiously the frank drunkard often escapes, while the man who drinks and stays sober suffers. Here it seems to be the cumulative action of the small but ever repeated dose which determines the result.

Recent Optical Patents.

Complete Specifications Published.

1916.

166905. Shschukin, Telemeters.

1917.

166568. Hamilton, Mounting and sighting apparatus for aircraft and anti-aircraft guns.

166570. Henderson, Gyroscopic apparatus.

166571. Henderson, Gyro-compasses and other gyroscopic apparatus.

166906. Henderson, Gyroscopic instruments and apparatus. Also 166907.

1918.

166575. Taylor, Telescopes for sighting armour-protected guns and for periscopes.

1919.

166589. Hamilton, Apparatus for use in finding the distance between the objects on the earth and/or sea from an elevated observation point.

1920.

146235. Optische Anstalt C.P. Goerz Akt. Ges., Sighting-telescopes more particularly for fire-arms.

146433. Optische Anstalt C.P. Goerz Akt. Ges., Periscopes, more particularly for submarines.

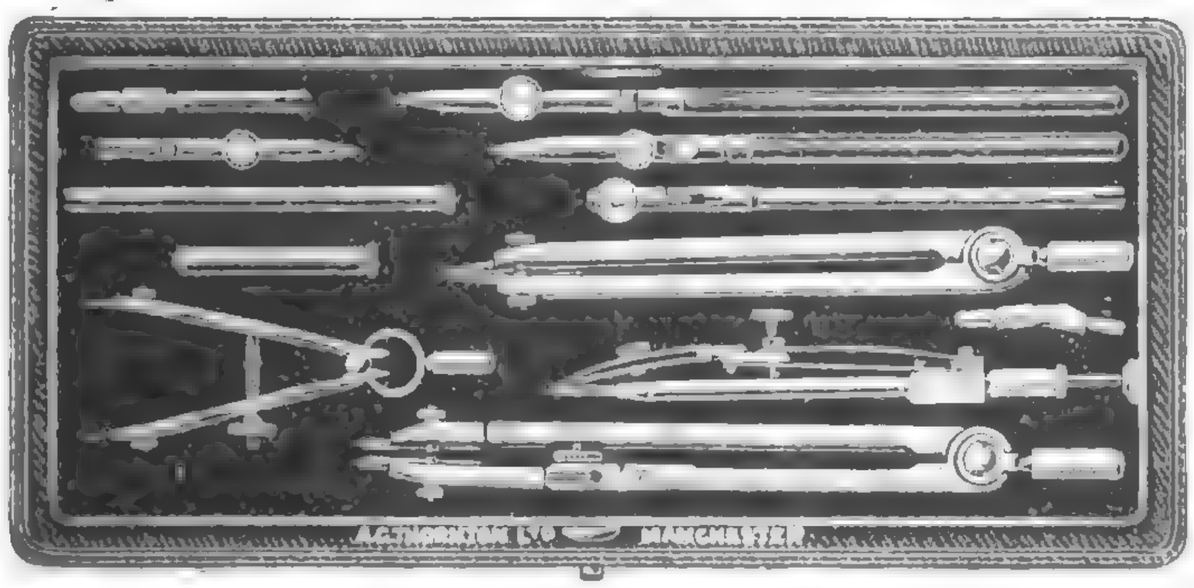
166742. Henderson, Kinematograph apparatus.

166800. Gray, Gyroscopic apparatus.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

BRITISH MADE DRAWING INSTRUMENTS



Pocket case of Show Instruments, from 18/9 each.

SPECIAL TERMS TO THE TRADE.

Produced in our Factory at Manchester.

A. G. THORNTON, LTD.

Contractors to the British, Colonial, and other Governments.

PARAGON WORKS,
20, KING ST., WEST,
MANCHESTER.

FOUND

AT 36, GRAY'S INN ROAD, LONDON, W.C. 1, A HOUSE THAT CAN GIVE YOU AN

EXCELLENT RX SERVICE

Combined with

SPEED, ACCURACY & INDIVIDUAL ATTENTION.

If you are looking for a house of this description, send a few trial orders and be

REWARDED

KIRK BROTHERS

WHOLESALE & MANUFACTURING OPTICIANS

36, GRAY'S INN ROAD, LONDON, W.C.1

Telephone: HOLBORN 1820 (Private Exchange). Telegrams: KIRBROREX, HOLB. LONDON.

Price List and Prescription Book on Application.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Manufacture Mécanique de Lunetterie & d'Optique

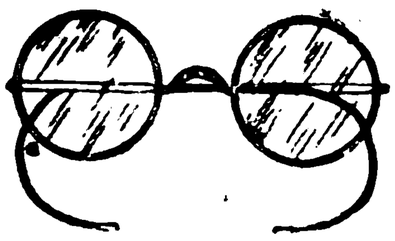
LIZON & Cie. at Morez du Jura — France. —

Formed by the amalgamation of the old firms:—HENRI COLIN FILS
ALPHONSE BUSSOD-ORY ANDRE CAMELIN LES FILS LOUIS LIZON
LOUIS ARBEZ GUY BUFFARD EMILE MANDRILLON

EYEGLASSES & SPECTACLES high-class goods in any metals and materials, any supplies for fitting and repairing spect. (straight and cable temples)

Clips, Rimless, Fits-u (Rivets, Screws, Crowns, Springs), D Eyes Spect. Frames with Collapsible and Folding Gauze Cups. Motor Goggles.

Optical Lens Manufacturers—Wholesale Only.



OPTICAL BLOCKS

To illustrate all features of Optical Service. Write for Lists.

CHEMISTS' DESIGN SERVICE,
12, Humberstone Gate, LEICESTER.

C. BAKER 244 HIGH HOLBORN LONDON
Estab. 1765

YOUR REQUIREMENTS however exacting, will probably be met from our Second-hand Stock
WRITE TO-DAY FOR LIST, POST FREE.

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
G. C. DYMOND. M.I.Mech.E., F.I.C.P.A

W. P. THOMPSON & CO.,

12, Church Street, Liverpool.
Chartered Patent Agents.
H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

T. WHEELER,

Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and ABRONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
Established 1878 Telephone City 419

PERCY S. DE SAULLES.

Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES.
Micro Cover Glasses, Glass Cells and Cavity Slips, etc.
The Platts, Amblecote, Stourbridge.

OPHTHALMIC AND SCIENTIFIC
MOULDINGS
Supplied in any Curvature and Glass.
CROOKES A SPECIALITY.
REYNOLDS & BAILEY, 15-19, VINE ST.,
LONDON, E.C.1

Worshipful Company of Spectaclemakers.

Tuition for the Company's Examinations in Optics and Sight Testing at
THE SCHOOL OF OPTICS Ltd.

2, GUILFORD PLACE, LONDON, W.C. 1
Particulars on application.

The Optician's Handbook.

Price 4s. 0d. Post Free.

An elementary text book required by every student of Optics.

It is an introduction to "The Study of the Refraction of the Eye, its Anomalies and their Estimation and Correction by means of Glasses.

The Hatton Press, Ltd.,

125, Fleet Street, LONDON, E.C.4

BRITISH OPTICAL INSTITUTE, LTD.,

(College of Optics).

Complete Training for the Sight-Testing Optician.

In addition to the usual Daily Classes and Correspondence Courses, there will commence shortly a series of Special Evening Classes, for those desirous of preparing themselves for any of the Optical Examinations.

A further series of Weekly Evening Lectures, and Demonstrations, for candidates for the F.B.O.A. Examination, and for post-graduates, has also been arranged.

Vacation Classes.

From July to October a series of Vacation Classes will be held for those who wish to widen their knowledge—not necessarily with a view to sitting for any examination.

The whole work of the Institute is carried out under the supervision of the Principal, assisted by Mr. G. W. Colebrook, F.B.O.A., F.S.M.C., (Master's Prizeman).

For full particulars apply to:—The Principal, Dr. Max Cogun, B.Sc., Fern Lodge, 20a, Grove Road, Brixton, S.W.9
Telephone: Brixton 677.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Telephone **JAMES B. SLY,** Central 10990.
9 & 10, EDWARD ST., WARDOUR ST.
LONDON, W. 1

To S.M.C., B.O.A. & I.O.O. DIPLOMA HOLDERS

Oak frames and modelled gold Arms for the diplomas The Arms of the S.M.C., City of London, and devices of the I.O.O., B.O.A. and Ph. Society in water colours, and framed dark oak, with descriptive engraved plate affixed, 27/6 each. Packed and put on rail.



Printed & Embossed Optical Stationery.
Steel Dies for use of Diploma Holders.
Electros of Coat of Arms & Optical Devices.
Engraved Seals, Prescription Forms, Signs, etc.
Price List on application.

Electro No. 12 Price 3/6

C. SWAIN, Ltd.,
51, Strand, London.

A B C Code 5th Ed.
'Phone:—GERRARD 5179. Factory: FOREST GATE.

UNCUT
Sphs
Sph Cyls
Plano Cyls

A.O.C. EDGED
Peris & Bi
Cx & Cc etc.,

at Best Prices.

F. BARKER & SON, LTD.
SUNDIAL HOUSE,
12, Clerkenwell Road, LONDON, E.C. 1
MANUFACTURERS OF ALL CLASSES OF
SCIENTIFIC AND OPTICAL GOODS.
Registered
Trade Mark
Estab. 1848
MANUFACTURERS OF
Aneroid Barometers, Compasses, Drawing, Mining, Surveying & Scientific Instruments of Every Description.
Illustrated and Descriptive Catalogue Post Free to any part of the World. Illustrated Booklet upon Sundials, Barometers and Compasses, Post Free. LISTS FREE.
Correspondence Invited. Bankers' and Trade References.
CLINICAL THERMOMETERS A SPECIALITY

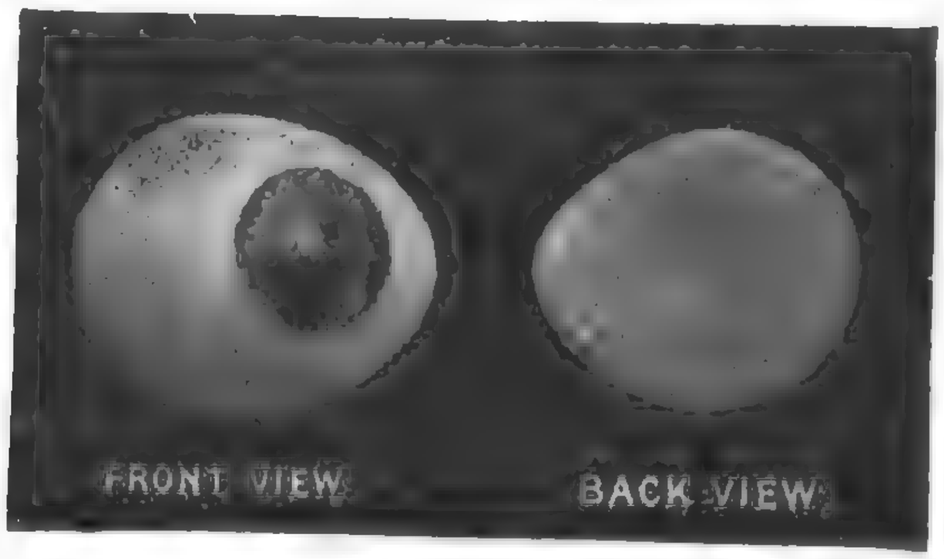
ARE YOU PUSHING

Chance's A2 Crookes?

We are. It is increasing our sales and bringing new customers.
Let us send *you* samples.
Show it to *your* clients.
Increase *your* sales.
Send for the W.O.W. price list.

WILLESDEN OPTICAL WORKS, LTD.
LENS FACTORY:
DUDDEN HILL LANE, N.W.10

SNELLEN'S IMPROVED ARTIFICIAL EYES
PACHE & SON, 75, Station St., Birmingham.



MAKERS TO THE PRINCIPAL HOSPITALS.
Selections sent to Surgeons. Also Makers of the ordinary Shell Eye

THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER
Subscription Form. **123-125, Fleet Street, London, E.C.4., England.**

Send a copy each week of THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER post free for which we enclose .....shillings for.....weeks.

UNITED KINGDOM 17s.
and ABROAD 20s.

Name.....
Business.....
Address.....
.....

A remittance of 17s. (or 20s. Abroad) for 52 issues includes "THE OPTICAL ALMANAC" post free.
Cheques made payable to The Hatton Press Ltd.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is 3d per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

"OPTICIAN'S MANUAL," Vols. 1 and 2. "Tscherning Physiological Optics." Offers, Morton, Dowlais.

WANTED Sight-testing business in good class district. Full details first instance, to Box 3464, c/o "The Optician," 125, Fleet Street, E.C.4.

FOR SALE. Quantity second-hand spherical and cylindrical surfacing tools. Stoco, auto edger, wooden jobbing trays, accept any reasonable offer. Apply, Dutton Armstrong and Co., Accountants, 4, Piccadilly, Manchester.

£20. Optician's stock comprising quantity R.G. finger-piece mounts, gold and R.G. frames, quantity rimless and other lenses, ear chains, material, etc., £20 the lot. Full particulars, apply to Box 3465, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED. 2 second-hand Trial cases, and latest type Keratometometer all in first-class condition. Apply, Ansell, 30, Pintsone Street, Sheffield.

WANTED. F.S.M.C. and notes. Mackenzie, Chemist, Inverness.

WANTED, the following back numbers of "The Optician," 1149, 1154, 1159, 1171, 1172, 1173, 1203, 1212, 1246, 1265, 1286, 1307, 1321, 1352, 1353, 1356, 1473, 1493, 1495, 1496, and 1522. Apply, to Box 3157, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

SIGHT-TESTING Business for sale, Midlands. Established 8 years, average £12 weekly, progressive district. Good reasons for selling. £600, including stock, fittings, etc. Box 3466, c/o "The Optician," 125, Fleet Street, E.C.4.

JEWELLERY-OPTICAL business for sale in South Wales by executor. Excellent opportunities for energetic business man. Several years lease to run. Principals only entertained. Box 3456, c/o "The Optician," 125, Fleet Street, E.C.4.

SIGHT-TESTING Business for sale. Old established. Main thoroughfare. North London. Good turnover. Lease. Accept £450 for quick sale. Box 3467, c/o "The Optician," 125, Fleet Street, E.C.4.

Apprenticeships.

APPRENTICE. Opportunity for gentlemanly youth to be trained to the optical and sight-testing profession by a qualified optician who has had a large experience, and now in high-class practice in London suburb. Apply, F.S.M.C., Box 3463, c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 6*

LADY Optician requires post. 5½ years' experience sight-testing. Retinoscopy, etc. Can take full charge. Box 5646, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, 21, desires situation with good class optician. Capable refractionist and salesman. Repairs. Knowledge of photography. Permanency desired. Good references. Box 5649, c/o "The Optician," 125, Fleet Street, E.C.4.

SMART ASSISTANT for front counter, must be good frame fitter and adjuster, well up in photography and with undeniable references. Address, giving full particulars of experience, age, height, etc., to Mr. Reid, 2, & 3, Queen Street, Exeter.

BLUE GOLD

Well hardly that, but we can do White or Yellow.

Write for samples and Prices. Rimmed and Rimless. Style and finish guaranteed.

IT WILL PAY YOU.

HAMPTON OPTICAL CO., Ltd.,
28, ESSEX STREET, BIRMINGHAM.

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,
DANDURAND BLDG., MONTREAL.
Cable "Optical" A.B.C. Code 5th. Edition.

TO LENS MANUFACTURERS

For Disposal (In Perfect Condition)

1 12 Spindle Machine for Bi & C-, L Lenses
1 20 „ „ „ Meniscus „
1 10 „ „ „ Deep Bi, Peris & Meniscus Lenses

Together with Blocks. Also a large quantityof White Blanks (Ovals and Rounds), And Dropped Blanks.

Full particulars on application to Box 3454, c/o "The Optician," 125, Fleet Street, E.C.4

F.S.M.C., D.B.O.A., seeks London engagement. 6 years workshop and consulting room experience. Accustomed to checking and general supervision. Apply, "Toric," c/o Ebbage & Son, Ophthalmic Opticians, Eden Street, Kingston-on-Thames.

EXPERIENCED traveller required by manufacturing opticians, preference for investment view to partnership. Full particulars to Box 5625, c/o "The Optician," 125, Fleet St., E.C.4.

FIRST CLASS rimless fitter seeks situation, edging and cementing, moderate 8 years' experience. Gladstone Cottage, Lilian Road, Streatham, S.W.

YOUNG LADY wanted for order department, previous experience essential. Good wages and permanent position to right person. Apply by letter, stating full particulars to Elliot Optical Co., 104/5, Great Saffron Hill, E.C.1.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

FINEST
ROUGH CYLINDER BLANKS.

Also good 2nd Selection
A very attractive proposition for Export and cheaper work.

CHANCE'S GLASS USED.

ACTUAL MANUFACTURERS
ASSOCIATED OPTICAL WORKS, Ld
5, Queen's Buildings, London, W.1
Near Tottenham Court Road.
No Connection with any other Firm. Telephone: Museum 2216.

Canadian Goggles.

American Styles, made in Canada to supply demand for British goods. A full line of colored lensed goggles in metal and zylo frames, with and without leather, metal and collapsible dust shields for motor, motorcycle, all out-doors, all industrial uses.

Send for Catalogs or Samples.

CANADIAN GOGGLE Co.,
Manufacturers,
37-39 King William St., HAMILTON, ONT.

Scientific Instrument Makers.

MICROSCOPES of all kinds manufactured at our own works.
REPAIRS to Prismatic and other Binoculars etc., promptly executed.

H. H. SHARLAND (H. KEMP),
9 & 10, THAVIES INN, HOLBORN CIRCUS, LONDON, E.C.
Tel.: Holborn 4040. Established 1860.

Every Description of Ophthalmic Supplies.
All Requirements of the up-to-date Sight Testing Optician.
Good Special Lines at keenly Competitive Prices.



CHEMICO CLEERVIEW.

Is the invention of a Spectacle user, who is also a chemist, who realized that sight might be considerably improved by the SCIENTIFIC CLEANSING and polishing of the lenses of SPECTACLES, EYEGLASSES, Etc.
Polishing the lenses by the usual method with the pocket handkerchief does not give that clear view and power of which the glasses are capable.
CHEMICO CLEERVIEW is a perfect cleanser and polish and has the peculiar property of preventing fogging and steaming.

THE COUNTY CHEMICAL Co., Ltd., Chemico Works, BIRMINGHAM.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

***A.*—Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. jor each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

COMMERCIAL Gentleman wanted. I have several vacancies for both Provincial and Town, for capable and energetic men, with knowledge and experience. Apply by letter, stating qualifications, etc., to F. H. Lyon, Manufacturing and Rx. Optician, 59/61, Hatton Garden, E.C.1.

SCIENTIFIC Instrument Maker, Turner, etc., requires position, 20 years' experience, optical, electrical, surveying, and drawing instruments, any capacity. London preferred. Apply, Box 5642, c/o "The Optician," 125, Fleet Street, E.C.4.

OPTICAL Refractionist, with S.M.C. or B.O.A. diploma preferred, required for high-class British firm in Ceylon, aged 25 to 33, single, excellent opening. Apply, giving full details of experience and stating whether dispensing chemist, to Box 5641, c/o "The Optician," 125, Fleet Street, E.C.4.

REQUIRED by West End Optician. Lady assistant. One who can do glazing and rimless fitting will have preference. (No sight-testing). Apply, giving full particulars to Box 5643, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. First-class salesman, until recently manager of one of the largest retail shops in London, is open to accept appointment in a business that is capable of increase and would be willing to receive remuneration by results, or would consider investment of £500 to £1,000. Partnership or otherwise. Write, H. Bevan, F.S.M.C., 43, Hastings Road, Southend-on-Sea.

YOUNG Gentleman, 24, studying for B.O.A. examination, desires post where practical experience may be gained, low salary. Box 5644, c/o "The Optician," 125, Fleet Street, E.C.4.

GLAZIER (Male), requires job or would be useful at shell work, etc. Apply, P., 20, Compton Buildings, Goswell Road, E.C.1.

SIGHT-TESTING Optician, thoroughly competent and reliable, good retinoscopist and salesman. Age 40. Tall, pleasant manner, seeks engagement. Box 5645, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. D.B.O.A., seeks London engagement, 6 years' workshop and consulting room experience. Accustomed to checking and general supervision. Apply, "Toric," 59, Eden Street, Kingston-on-Thames.

REFRACTIONIST, 33, tall, smart appearance, with long sight-testing and practical experience (London and Provincial) requires situation as branch manager or assistant, excellent references. West of England or South Wales preferred. "Trolos," 22, Toronto Road, Horfield, Bristol.

FIRST-CLASS Rimless fitter seeks situation, edging and bifocal worker. Age 21. Wholesale and retail experience. London or suburbs preferred. Box 5647, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST ASSISTANT (24), 9 years' experience wholesale and retail, requires situation with good class firm. Smart salesman, reliable tester, and conscientious worker. Used to taking full charge. Wide experience in oculists' prescriptions. Would consider good wholesale position London or suburbs preferred. Excellent references. Disengaged Sept. 30th, 21. Box 5648, c/o "The Optician," 125, Fleet Street, E.C.4.

TOOLMAKER seeks situation. Press tools, capstan and general work. 22. Experience, 14 years in optical works. Apply, W. T., 766, Holloway Road, N.19.

OPTICIAN certified, experienced branch manager, would like similar post. Midlands preferred. Box 5632, c/o "The Optician," 125, Fleet Street, E.C.4.

GOOD all-round gold worker, excellent references could take charge. Box 5633, c/o "The Optician," 125, Fleet Street, E.C.4.

BERTH wanted by first-class all-round gold worker used to taking charge. Box 5634, c/o "The Optician," 125, Fleet Street, E.C.4.

COMPETENT sight-testing assistant with knowledge of Photography wanted for Manchester. Apply, Box 5635, c/o "The Optician," 125, Fleet Street, E.C.4.

REQUIRED for India, thoroughly competent optician, qualified preferred. Apply, Lawrence & Mayo, Ltd., 19, New Oxford Street, W.1.

FRENCH optician seeks employment. Good references Write D.B., 42, St. Elmo Road, Shepherd's Bush, W.12.

EXPERIENCED all-round glazier seeks situation rimless edging, drilling, fitting and cementing. Write, W.B.C., 114, Kilburn Park Road, Kilburn.

ASSISTANT, age 18, requires situation. Attend customers and general jobbing. London or provinces. Apply, I.J., 52, Battersea Park Road, S.W.11.

MANAGER. 3 years' experience in sight-testing with thorough knowledge of workshop routine desires change Eastern or South Eastern counties preferred. Permanent. Good reference. Box 5630, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN, 21, desires situation as assistant to retail Optician experienced in sight-testing, etc.. Box 5631, c/o "The Optician," 125, Fleet Street, E.C.4.

CARETAKER, and assist in warehouse, etc. Young ex-service man, strong and willing. Married, no children. Good references. Please address F. Rowe, 11, Finck Street, S.E.1.

D.B.O.A. desires position, City or West End, extensive wholesale and retail experience. Write, Box 5639, c/o "The Optician," 125, Fleet Street, E.C.4.

GENTLEMAN, thoroughly experienced manufacture optical and scientific instruments. Machine shop work, assembling and adjusting, requires position, could assist management. Box 5636, c/o "The Optician," 125, Fleet Street, E.C.4.

SIGHT-TESTING assistant, 24, offers services to good class firm or employer. Nearly two years' excellent experience. Sound frame fitting and repairs. Trustworthy. State approximate salary. Apply, Raymond Worgan, Rumney, Cardiff.

YOUNG LADY, D.B.O.A., a daughter of a qualified optician seeks a situation in London. For sight-testing, frame fitting, has a general optical experience, typewriting, etc. Box 5637, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED traveller. London provinces and abroad desires engagement to manufacturing opticians, including surveying instruments and drawing office materials. Fluent French. Highest credentials. Box 5640 c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED. Sight-testing assistant, preferably qualified and with knowledge of amateur photography. Apply, P. Harrison, F.B.O.A., 120, Commercial Road, Portsmouth.

COMPETENT surfacer seeks situation thoroughly experienced. Torics, cyls., sphere. Apply, W.M., 32, Vernon Gardens, Seven Kings, Ilford.

SMART energetic young man desires position to travel for wholesale house. Moderate terms. Box 5629, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, female rimless drillers and fitters, first class work, permanent. Apply, Box 5547, c/o "The Optician," 125, Fleet Street, E.C.4.

Concluded on page 4.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE

U.K. TORIC LENSES.

We beg to announce that in future we propose making our FINISHED TORICS Base + 6.0 with MINUS as well as PLUS cylindrical power. That is to say our Base + 6.0 Torics will be worked in two forms.

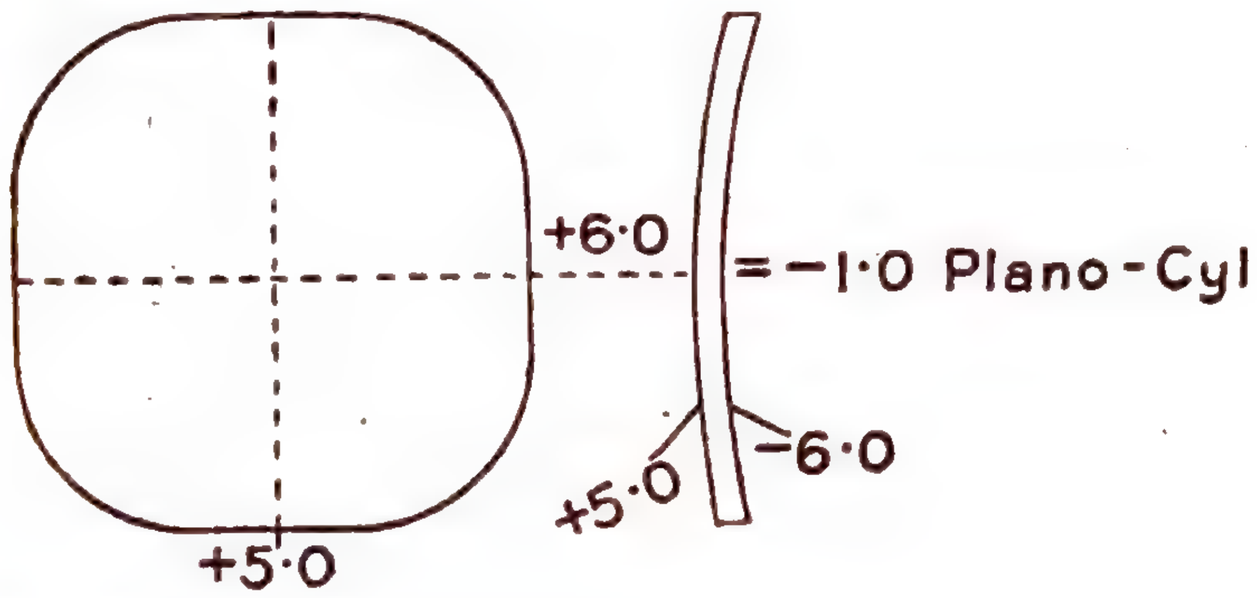
(1) Torics for PLUS combinations will have the Toric surfaces with the curve in one meridian + 6.0 and the curve in the other meridian deeper according to the (+) cylindrical power.

(2) Torics for MINUS combinations will have the Toric surfaces with the curve in one meridian + 6.0 and the curve in the other meridian shallower according to the (−) cylindrical power.

The advantages are that MINUS lenses will not require to be surfaced on excessively deep concave tools and the axis of the cylinder remains constant with the + 6.0 Base curve.

All Plano-Cylinders whether Plus or Minus will be worked with a — 6.0 spherical surface.

The diagram illustrates the 2nd form and it will be seen that by adding the spherical power required to — 6.0 the correct surfacing tool is given without having to transpose the cylinder.



Convex Toric Blanks can be supplied in either of these forms but unless specifically ordered the + 6.0 and deeper curve will be supplied.

Whilst making this announcement we beg to state that our Concave Torics are only made with — 6.0 Base curve and deeper, until the Cylindrical Power exceeds — 4.0 when we make the Base Curve — 4.0.

A selection from these Toric blanks will permit most Rx to be produced with the best appearance and effect.

UNITED KINGDOM OPTICAL CO., LTD.,

(Wholesale and Export Only.)

MILL HILL, LONDON, N.W.7

Digitized by Google

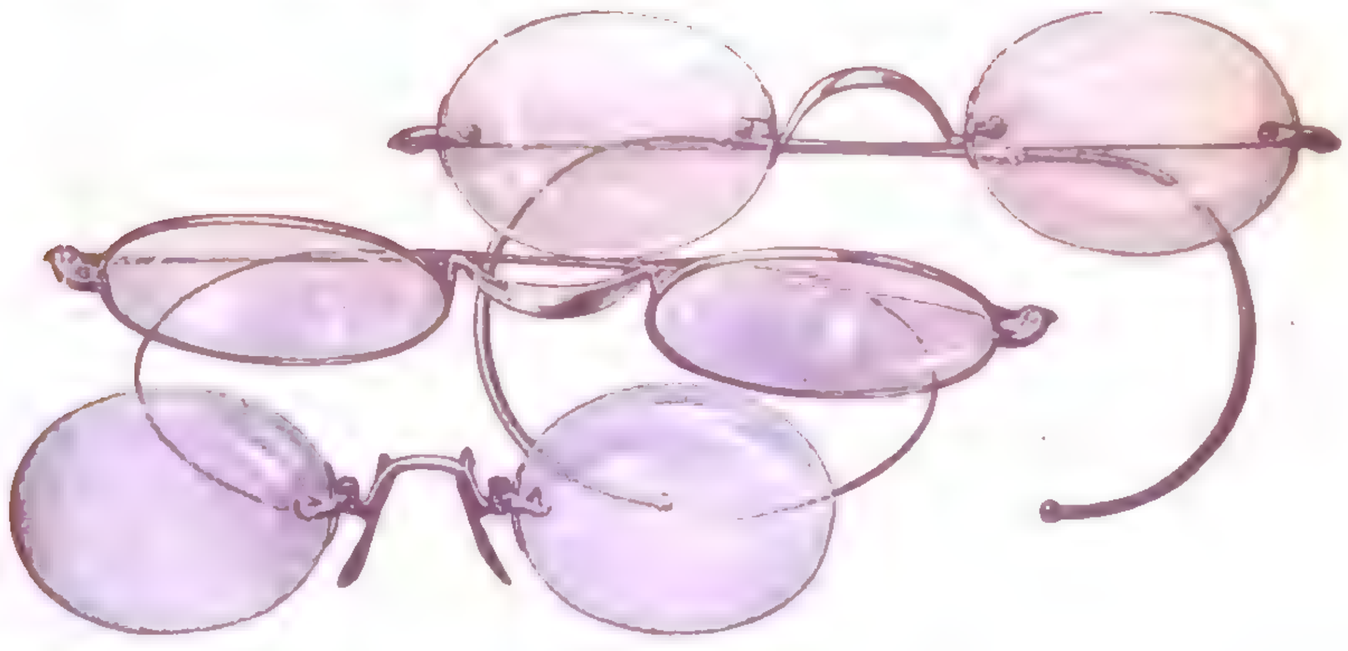
Original from THE OHIO STATE UNIVERSITY

AMERICAN OPTICAL COMPANY, LIMITED

WELLSWORTH

ALUMNICO

SPECTACLES and EYEGLASSES



AOCo. supremacy in White Metal Goods dates back to the early history of the oldest Optical House in America. As one of the oldest lines, Wellsworth Alumnico embodies the practical experience of generations of skilled workmen.

All AOCo. Alumnico Goods are manufactured from a special metal made by them according to their own specifications. This explains its strength, resiliency, evenness of temper and freedom from brittleness.

If you have never used Wellsworth Alumnico, we suggest that you try it out on some of your most difficult work. Such a test will do more to convince you than any words we can write here.

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C.4. (Printed by The Century Press, Fulham.) Sep. 2, 1921.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1589 FRIDAY, SEPT. 9, 1921.

WELLSWORTH FITS-U WINDSOR EYEGLASSES.



THE FIRST THING—

that people require of Glasses is good looks. Sometimes it is called distinction of appearance, sometimes attractiveness, sometimes simply beauty. But whatever it is called the Fits-U Windsor has it.

The Wellsworth Windsor construction is protected by British Letters Patent. Beware of infringemets.

WELLSWORTH

TRADE (A) MARK (Regd.)

OPTICAL PRODUCTS.

AMERICAN OPTICAL COMPANY, LIMITED,

39, Hatton Garden, LONDON, E.C.1

Reg'd at the G.P.O. as a newspaper **PRICE 4d** *Subscription post free 12 months 17s*

Postage in United Kingdom 1d

Subscription including "Optical Almanac," post free **20s.** *yearly. The Hatton Press, Ltd., 12-5, Fleet St., London, E.C.1.*

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

GEORGE CULVER LTD

Manufacturing Opticians,

JOBBING AND PRESCRIPTION WORK

ACCURACY,

NEATNESS,

PROMPTNESS

Large and full stocks of English made Lenses of all combinations. Orders can be executed promptly.

OPTICAL WORKS:
WHITE LION STREET,
PENTONVILLE,
LONDON, N. 1

TELEPHONE:
NORTH 369 and 871

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

W.H.T.

NOTHING BUT THE BEST IS GOOD ECONOMY.

THEREFORE PLACE YOUR COMMANDS WITH THE

HOUSE THAT WILL GIVE YOU THE BEST

WORKMANSHIP & SERVICE

PRESCRIPTION WORK

EXECUTED PROMPTLY & EFFICIENTLY

OPTICAL SUPPLIES OF EVERY DESCRIPTION FROM THE TRIAL CASE TO THE EYEGLASS CHAIN

WALTER H. THOMPSON

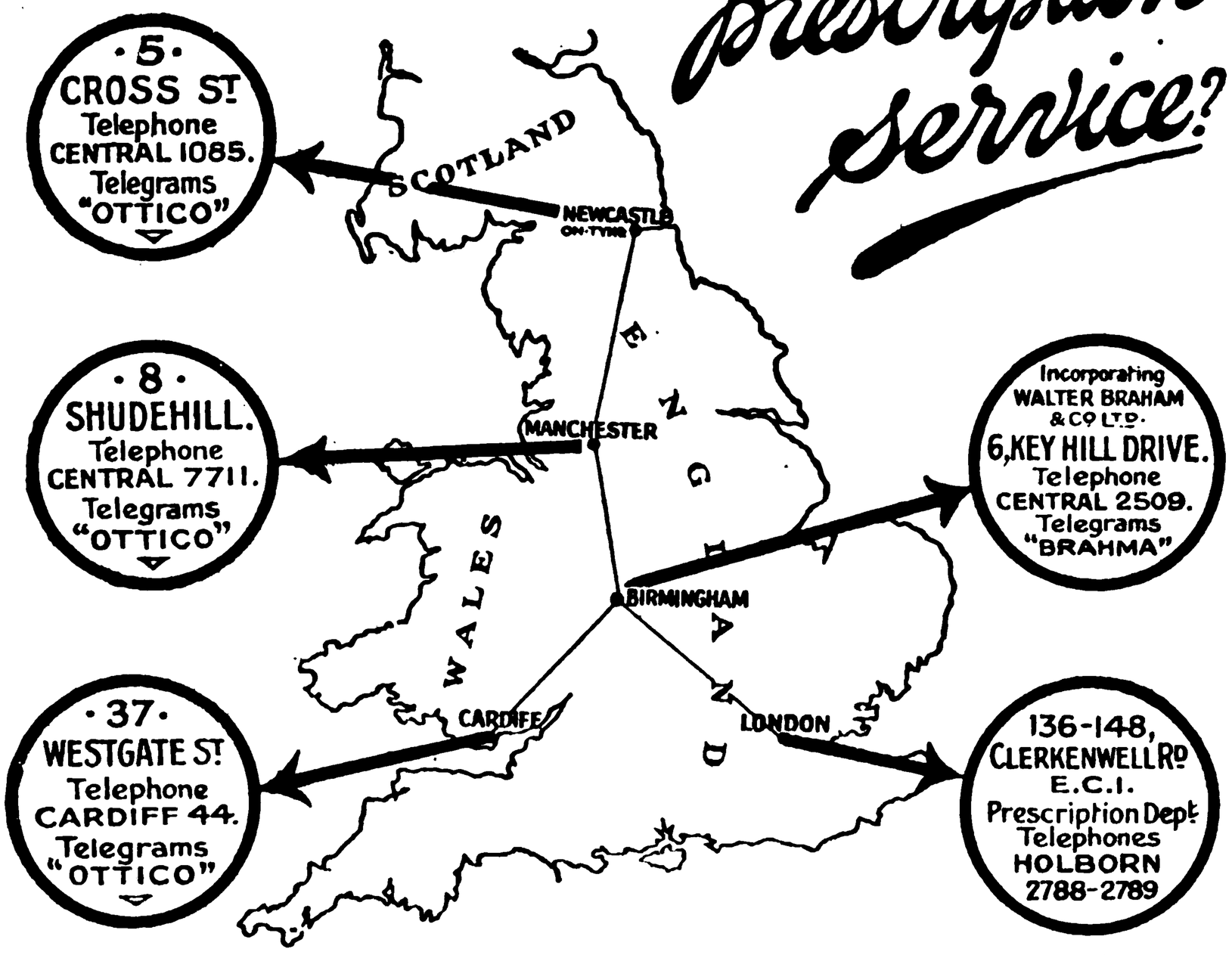
66 HATTON GARDEN, LONDON, E.C. 1.

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

J&R.F.LTD

Why not link yourself with our prescription service?



Each Branch has a Complete Prescription Equipment.

LINK QUALITY SERVICE BRAND
Reg'd Trade Mark.

J & R. Fleming Limited.

136-148. Clerkenwell Road, LONDON, E.C.1.

Telegrams: "OTTICO" SMITH, LONDON.

J&R.F.LTD

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
Col. & Ald. Sir CHARLES C. WAKEFIELD, Bt., C.B.E.

Upper Warden
The Rt. Hon. VISCOUNT HILL.

Renter Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Director of Examinations
The Rt. Hon. Sir WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS

of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., on Oct. 31st, 1921, and during the first week in November.

Last date for Entries, Sept. 30th.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT·MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,589

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices
123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, SEP. 9, 1921

Ophthalmic Prisms.—When a prism has been added to the spherical lens prescribed in the trial frame, it becomes necessary to ascertain what form will best embody the combination resulting from the test in a single piece of glass. By toric grinding, both a sphere and a cylinder can be worked on one surface, leaving the other plane, where it is obvious a prismatic power can be added. But in most cases the introduction of a prism by decentration is to be preferred, the resulting aberration being negligible in ophthalmic work. A correspondent asked last week for some suggestions on the subject; but as was stated, all the technical details with diagrams and tables are to be found in Laurance's "General and Practical Optics" and other text books. For anyone handling spectacles in his business, who has not yet paid attention to this matter of decentering, a few very elementary remarks on it may have some interest. This, at least, is suggested by the letter that we printed.

* * *

Considering a lenticular section through the axis of any spherically surfaced glass, it will be obvious that upon either side of the optical

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

axis or centre of the lens, we can draw symmetrical pairs of chords (in the case of a biconvex lens) or symmetrical pairs of tangents to the curved faces (in the case of a biconcave lens), or pairs of lines each pair comprising a chord and a tangent (in the case of a meniscus lens). The lines of each pair are inclined to one another, and bound the sides of a prismatic section within the glass, having its base towards the centre of a plus and towards the edge of a minus lens. Another point which is obvious if we confine our attention to the equi-curved lenses, is that the inclinations to one another of the pairs of tangentially directed lines (or in other words the powers of the prismatic elements) increase as we pass from centre to circumference of lens. Thus decentering involves the introduction of a prismatic element stronger according to the amount of decentration, and having its base-apex line in the direction in which the decentration is made.

* * *

Decentering Lenses.—Suppose, to fix the ideas, that we take an ordinary unit convex lens, of 1D or of 1 meter focal length; and suppose the decentration amounts to 1 centimeter. Now the wearer's line of sight is directed straight forward through the geometrical centre (or centre of the "eye" of the spectacle lens); but the optical centre or axis of this lens is moved through 1 cm. in some meridian away from the line of vision. The path of light is generally speaking reversible, so we can trace the direction of vision outward from the eye through the spectacle-lens as if it were an outgoing ray of light instead of being the line of sight corresponding to an incoming ray. Hence it is evident that when the spectacle-wearer looks straight forward at objects in a vertical plane (say the graduations on a prismometric chart) at the focal distance of the lens of 1 meter, by the collecting power of the lens his actual line of sight will deviate through 1 cm. in the path of decentration, away from the point on the scale to which his apparent line of sight is directed. Similarly whatever may be the focal length of the lens, a decentration of 1 cm. or any other specified distance will mean a like deviation of the actual from the apparent point of sight on a prism chart erected in the focal plane of the lens.

* * *

Angular Measurements.—Preferably the prism chart would be curved to a circle about the optical centre of the lens. With such a curved chart or scale of 1 meter radius, each centimeter of arc would measure a prismatic deviation of 34′; and a deviation of 1° would be measured by 1.745 cm. (approximately, of course). Let the circular scale be divided either in centimeters of displacement or degrees of angle, by radial lines drawn fom the centre of the spectacle lens; then if any other concentric circular scale be drawn, it will be cut by the same lines of direction in arcs proportional to the radii. Thus, if the new circle be drawn of 20 cm. radius, to pass through the principal focus of a 5D lens, its arcs corresponding to the 1 cm. arcs at a meter, will be of .2 cm. Hence, .2 cm. decentration of a 5D lens is as effective for prism power as 1 cm. decentration of a 1D lens. And generally speaking, the prismatic power introduced by any given amount of decentration is inversely proportional to focal length and directly proportional to dioptric strength. We have seen also that the prismatic power is directly proportional to decentration in centimeters (C). Therefore, it is measured by DC.

* * *

The Tangent Scale.—For mechanical convenience it is better to have a tangent scale than a curved scale of arcs; and on our imaginary diagram of radial dividing lines, such a scale is obtained by drawing a tangent to any of the circles, touching at the focal point of the lens of corresponding power. Often the distance of 1 meter is preferred. The divisions on a tangent scale, unlike the arcs, broaden out as they recede from the zero mark. Thus on a 1 meter tangent scale, the measurement for 1° is approximately 1.745 cm., but 10° is measured by 17.63 cm., not 17.15. Here the ratios of the tangent divisions to the radius are not constant as were those of the arcs; but they are strictly comparable as between tangent scales adapted to any different distances. That will be understood from the symmetry of construction, and from the fact that the tangent, like the other trigonometrical ratios, has a constant value for each angle. In any right-angled triangle, the tangent is a fraction which has for its numerator the length of the side opposite the angle measured, and for its denominator that of the remaining shorter side. For large angles, the tangents increase so much that a meter scale becomes unmanageable; but for the comparatively small angles used in ophthalmic prismetry, it is not even common

Matter intended for the current weeks' "Optician" must reach this office on the Tuesday morning preceding publication.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

to trouble with making a true tangent scale. The simple uniform scale of centimeters on a flat card is used, 1 cm. at the meter, 2 cm. at 2 m., or 3.5 cm at 3.5 m. This last odd number corresponds to the scaling of the "Orthos" chart, which can be used for degrees deviation (^{o}d) at 2 m. and for prism diopters ($\triangle$) at 3.5 m.

* * *

Prism Diopters.—The prism diopter is the name which was given by Dr. Prentice, one of the scientific staff of the American Optical Company, to the units shown on a uniform centimeter "tangent scale," *i.e.*, to units of 1 per cent. linear deviation. It has won general acceptance among both sight-testing opticians and oculists, and is largely adopted by manufacturers of ophthalmic prisms. The true tangent scale for 20 units of 34′, or for 11°20′, is 21.86 cm., so that even in this exceptional case, the error is under 10 per cent. For any considerable decentration, as for example 4 cm., with a 1D. lens, which means 4$\triangle$, the ordinary centered lens discs are, of course useless, as they are seldom much more than about 4 cm. diameter, and a few mm. may be all that there is to spare in width. For this prescription, a lens of 12 cm. diameter is called for; but the practical way out of the difficulty is to grind an ordinary blank as if it were located near the edge of such a 12 cm. lens; that is, to grind a prism into the sphere. Cylinders when decentered across the axis behave like the corresponding sphere; in the axial direction there is no effect, of course. The resultant of two prismatic powers can be obtained graphically or by a simple calculation. When measuring the prismatic effect in a lens it must be held up square to the tangent scale, and a strong spherical power must be neutralised.

THE SAFEGUARDING OF INDUSTRIES ACT, 1921.

Part I.

Safeguarding of Key Industries.

1.—(1) Subject to the provisions of this Act, there shall be charged, levied, and paid on the goods specified in the Schedule to this Act, on the importation thereof into the United Kingdom, duties of customs equal to one-third of the value of the goods.

(2) Where any other duties of customs, not being duties chargeable under Part II. of this Act, are chargeable in respect of any goods chargeable with duty under this section, duty under this section shall not be charged except in so far as the amount thereof exceeds the amount of those other duties.

(3) No duty shall be charged under this section on goods which are shown to the satisfaction of the Commissioners to have been consigned from and grown, produced or manufactured in the British Empire, and for the purposes of this subsection goods shall be deemed to have been manufactured in the British Empire which would be treated as having been so manufactured for the purposes of section eight of the Finance Act, 1919, which relates to Imperial preference), and that section shall apply accordingly.

(4) Where an imported article is a compound article of which an article liable to duty under this section is an ingredient or forms part, no duty shall be charged under this section in respect of the compound article if the compound is of such a nature that the article liable to duty has lost its identity, and any dispute as to whether an article has lost its identity shall be determined in like manner as disputes as to whether goods are goods specified in the Schedule to this Act.

(5) For the purpose of preventing disputes arising as to whether any goods are or are not any goods chargeable with duty under this Part of this Act, the Board may from time to time issue lists defining the articles which are to be taken as falling under any of the general descriptions set out in the said Schedule, and where any list is so issued defining the articles which are to be taken as falling under any such general description the said Schedule shall have effect as if the articles comprised in the list were therein substituted for that general description.

Every list issued under this section shall be published forthwith in the London, Edinburgh, and Dublin Gazettes, and in such other manner as the Board think proper.

If within three months after the publication

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

of any such list any person appearing to the Board to be interested delivers to the Board a written notice complaining that any article has been improperly included in, or excluded from, the list, the Board shall refer the complaint to the arbitration of a referee, to be appointed by the Lord Chancellor, who shall not be an official of any Government department, and the decision of the referee shall be final and conclusive, and the list shall be amended so far as is necessary in order to give effect to the decision, without prejudice, however, to the validity of anything previously done thereunder.

Part II.

Prevention of Dumping.

2.—(1) If, on complaint being made to the Board to that effect, it appears to the Board that goods of any class or description (other than articles of food or drink) manufactured in a country outside the United Kingdom are being sold or offered for sale in the United Kingdom—

(*a*) at prices below the cost of production thereof as hereinafter defined; or

(*b*) at prices which, by reason of depreciation in the value in relation to sterling of the currency of the country in which the goods are manufactured, not being a country within His Majesty's Dominions, are below the prices at which similar goods can be profitably manufactured in the United Kingdom;

and that by reason thereof employment in any industry in the United Kingdom is being or is likely to be serious affected, the Board may refer the matter for inquiry to a committee constituted for the purposes of this Part of this Act:

Provided that the Board shall not so refer any matter involving a question of depreciation of currency unless they are satisfied that the value of the currency of the country in question in relation to sterling is less by thirty-three and one-third per cent., or upwards, than the par value of exchange.

(2) The Board, on referring any such matter to a committee, shall direct that the committee shall report also on the effect which the imposition of a duty under this Part of this Act on goods of any particular class or description would exert on employment in any other industry being an industry using goods of that class or description as material.

(3) If the committee report that as respects goods of any class or description manufactured in any country the conditions specified in subsection (1) are fulfilled the Board may, after taking into consideration the report, if any, made under subsection (2) by order apply this Part of this Act to goods of that class or description if manufactured in that country:

Provided that—

(*a*) no order shall be made under this section applying this Part of this Act to goods of any class or description unless the committee to whom the matter has been referred under this section have reported that in their opinion production in the industry manufacturing similar goods in the United Kingdom is being carried on with reasonable efficiency and economy; and

(*b*) no such order shall be made which is at variance with any treaty, convention or engagement with any foreign state in force for the time being.

(4) If at the time when it is proposed to make any such orders the Commons House of Parliament is sitting or is separated by such an adjournment or prorogation as will expire within one month, the drafts of the proposed orders shall be laid before that House and the orders shall not be made unless and until a resolution is passed by that House approving of the drafts either without modification or subject to such modifications as may be specified in the resolution, and upon such approval being given the orders may be made in the form in which the drafts have been approved.

In any other case an order may be made forthwith, but all orders so made shall be laid before the Commons House of Parliament as soon as may be after its next meeting, and shall not continue in force for more than one month after such meeting unless a resolution is passed by that House declaring that the orders shall continue in force, either without modification or subject to such modifications as may be specified in the resolution; and, if any modifications are so made as respects any order, the order shall thenceforth have effect subject to such modification, but without prejudice to the validity of anything previously done thereunder.

Any order approved or continued under this subsection shall have effect as if enacted in this Act.

3.—(1) Subject to the provisions of this Part of this Act, there shall be charged, levied and paid on goods of any class or description in respect of which an order has been made under this Part of this Act, if manufactured in any of the countries specified in the order, on the

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



Chance's 'CROOKES' Glass

is the original, genuine Crookes Glass.

One of the most eminent Scientists in the whole of history found by research its original formula. We manufacturers of glass for considerably over a century, developed that formula by constant research and experiment. To that research and to our experience its present degree of perfection and its present widespread availability are solely due.

The prefix *Chance's* is the guarantee of quality of *Crookes Glass.*

CHANCE BROS. & CO., LTD.,
GLASS WORKS, SMETHWICK, BIRMINGHAM.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Phone:—City 3225 (3 lines) *Telegrams :—Bulford, BARB. London.*

There is a Charm about Real Tortoise Shell

The Exclusive Models made by us ADVANCE THE ART.

Real Shell Spectacles with Silver joints and inserted sides.

ditto Gold ditto

ditto Gold joints and sides

Real Shell Spectacle Front and "Inviso" cable sides.

Gold "Inviso" Mounts with Real Shell Rims.

Gold "Ace-of" Mounts with Real Shell Rims.

ETC., ETC.

Made by the firm whose Reputation for Prescription Work is :—*"Second to None."*

NEWBOLD & BULFORD, ***Prescription House,***
GOSWELL ROAD, LONDON,
E.C.1

Digitized by Google Original from THE OHIO STATE UNIVERSITY

importation thereof into the United Kingdom, in addition to any other duties of customs chargeable thereon, duties of customs equal to one-third of the value of the goods.

(2) Where goods are manufactured partly in one country and partly in another, or undergo different processes in different countries, and any one or more of those countries are countries in relation to which an order applying to the goods in question has been made under this Part of this Act, the goods shall be liable to duty under this Part of this Act unless it is proved to the satisfaction of the Commissioners that twenty-five per cent. or more of the value of the goods at the time of export to the United Kingdom is attributable to processes of manufacture undergone since the goods last left any country in relation to which such an order has been made.

(3) An order under this Part of this Act may extend to goods brought back into the United Kingdom after having been exported therefrom for the purpose of undergoing any process out of the United Kingdom, and in such case the goods shall be deemed for the purposes of this Part of this Act to have been manufactured in the country in which they have undergone such process, but the importer shall, on proof to the satisfaction of the Commissioners of the value of the goods at the time of such exportation, and of the identity thereof, and that no drawback has been allowed thereon on the exportation thereof, be entitled to be repaid by the Commissioners such proportion of the duty paid under this Part of this Act on the goods so brought back after having undergone such process as aforesaid as represents one-third of the value of the goods before exportation and of freight and insurance outwards.

4. Where an order has been made under this Part of this Act applying this Part of this Act to goods of any class or description on the ground that goods of that class or description are being sold or offered for sale in the United Kingdom at prices below the cost of production thereof, the following provisions shall have effect:—

(1) If any person by whom any duty would be payable proves to the satisfaction of the Commissioners that the goods in respect of which the duty is payable, have already been sold in the United Kingdom at a price which was not less than the cost of production the payment of duty shall be remitted.

(2) If any person by whom any duty has been paid proves to the satisfaction of the Commissioners that the goods were on the first sale thereof within the United Kingdom sold at a price which was not less than the cost of production of the goods, or where he shows that there has been a change in the market conditions of the country of manufacture, not less than the amount which would on the date of sale have been the cost of production in that country of similar goods, he shall be entitled to repayment of the duty so paid.

(3) No such remission or repayment of duty shall be made, unless and until there is produced to the Commissioners a declaration in the prescribed form made by the consignor of the goods stating the cost of production, at the date of the declaration, of the goods, and the country of manufacture of the goods, certified by a British consular officer, or by some other person duly authorised by the Board to give certificates for the purposes of this Part of this Act, to be to the best of his knowledge and belief a true declaration.

For the purpose of any claim to remission or repayment of duty under this section, the declaration by the consignor, duly certified by a British consular officer or other person as aforesaid, shall, unless proved to have been obtained by fraud, be conclusive evidence of the amount of the cost of production of the goods to which the declaration relates.

A certificate under this section shall be in such form and be subject to such conditions as to period of validity and otherwise as the Board may direct.

(4) Where goods which have been charged with duty are, without being sold, used in the United Kingdom for any purpose, they shall, for the purposes of this section, be deemed on being so used to have been sold, and in such a case the sale price shall, for the purposes aforesaid, be taken to be an amount representing the price at which the goods were actually purchased from the exporter, together with freight and insurance and the amount of the any import duty, other than the duty under this Part of this Act, which may have been paid in respect of the goods.

5. It shall be lawful for the Commissioners, in the case of any goods which if manufactured in a particular country would be liable

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

to duty under this Part of this Act, to require the importer to furnish to the Commissioners proof in the prescribed form with respect to the country of manufacture of the goods, and if such proof is not furnished to the satisfaction of the Commissioners the goods shall be deemed to be goods manufactured in the first-mentioned country:

Provided that the Commissioners shall require such proof in the case only of goods consigned from such countries as the Board may direct.

6. Subject to such conditions as the Commissioners may direct for securing that the provisions of this Part of this Act shall not be evaded, this Part of this Act shall not apply to any goods which had left the place from which they were consigned to the United Kingdom not later than fourteen days after the date of the order applying this Part of this Act to goods of the class or description in question.

7.—(1) A committee for the purpose of this Part of this Act shall consist of five persons selected by the President of the Board from a permanent panel of persons appointed by him who shall be mainly persons of commercial or industrial experience.

(2) Any person whose interests may be materially affected by any action which may be taken on the report of a committee shall not be eligible for selection as a member of the committee.

(3) A committee to whom any matter is referred under this Part of this Act shall forthwith in accordance with such rules of procedure as may be prescribed inquire into the matter so referred and report thereon to the President of the Board:

Provided that the sittings of the committee at which evidence is taken shall be held in public, except that the committee shall refuse to allow the public to be present at any proceedings of the committee during the hearing of evidence on matters which, in their opinion, are of a confidential character.

8. In this Part of this Act the expression "cost of production" in relation to goods of any class or description means the current sterling equivalent of ninety-five per cent. of

(*a*) the wholesale price at the works charged for goods of the class or description for consumption in the country of manufacture, subject to the deduction of the amount of any excise or other similar internal duty leviable in that country and included in the price; or

(*b*) if no such goods are sold wholesale for consumption in the country of manufacture, the price at the works (subject to the like deduction) which would have been reasonable if the goods had been so sold, and in determining what price would have been reasonable regard shall be had to the wholesale prices charged for goods as near as may be similar.

9. An order made under this Part of this Act shall, unless previously revoked by the Board, continue in force for three years or such less period as may be specified in the order; but any such order may, subject to the provisions of this Part of this Act, be renewed from time to time by an order made in like manner and subject to the like conditions as the original order:

Provided that the Board shall not have power to revoke any such order either wholly or as respects any country or article to which the order relates except after reference to and consideration of any report thereon by a committee constituted under this Part of this Act, and that an order made on the ground of depreciation of foreign currency shall not be made or continue in force after the expiration of three years from the passing of this Act.

Part III.

General.

10.—(1) The value of any imported goods for the purpose of this Act shall be taken to be the price which an importer would give for the goods if the goods were delivered to him freight and insurance paid, in bond at the port of importation, and duty shall be paid on that value as fixed by the Commissioners.

(2) If in ascertaining the proper rate of duty chargeable on any goods under this Act any dispute arises as to the value of the goods, that question shall be referred to the arbitration of a referee, appointed by the Lord Chancellor, who shall not be an official of any Government department, and the decision of the referee with respect to the matter in dispute shall be final and conclusive.

Sections thirty and thirty-one of the Customs Consolidation Act, 1876, shall, as respects any such dispute as to value, have effect as if an application for a reference to a referee under this provision were substituted for the action or suit mentioned in those sections.

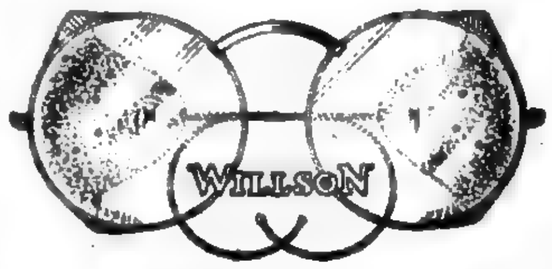
11. If any dispute arises as to whether any goods imported into the United Kingdom are goods specified in the Schedule to this Act or in any list made by the Board under Part I. of this Act, or are goods to which an order

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

WILLSON GOGGLES

We Invite Correspondence.

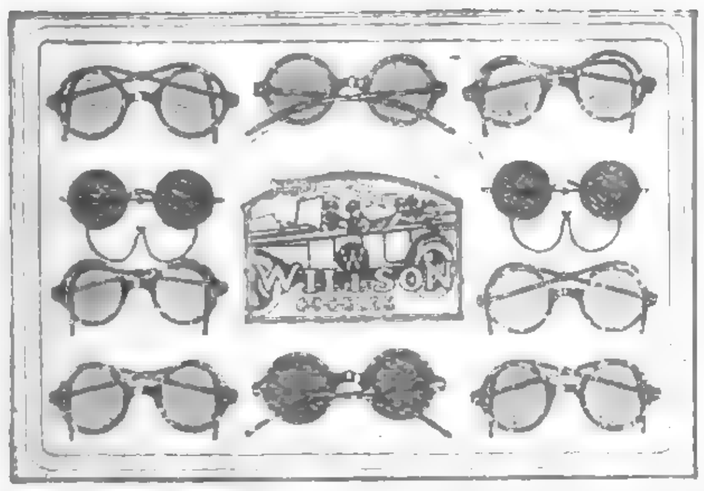
We manufacture goggles for protecting the eyes from sunlight, dust, glare and wind. Also safety goggles for protecting workmen at industrial operations.



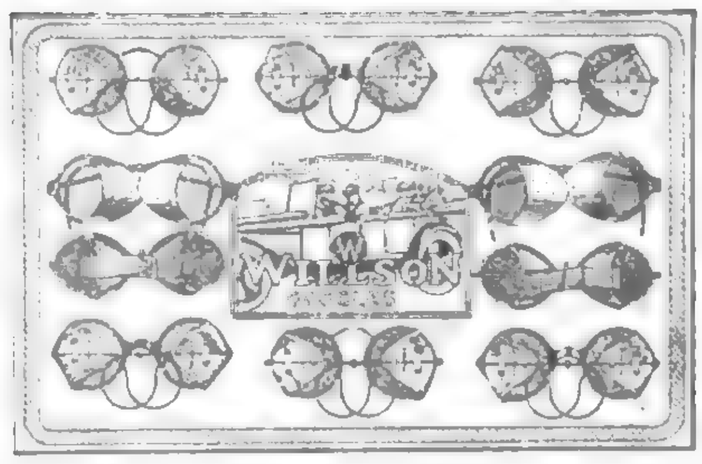
Style A1.—48mm micoquille lenses in amber, fleuzal, smoke and amethyst colors; or clear. Good leather side shields, adjustable bridge and cable temples. Metal case.



Style N88.—48mm micoquille lenses in amber, fleuzal, smoke and amethyst colors; or clear. Perforated metal side shields, saddle bridge and cable temples. Cardboard box.

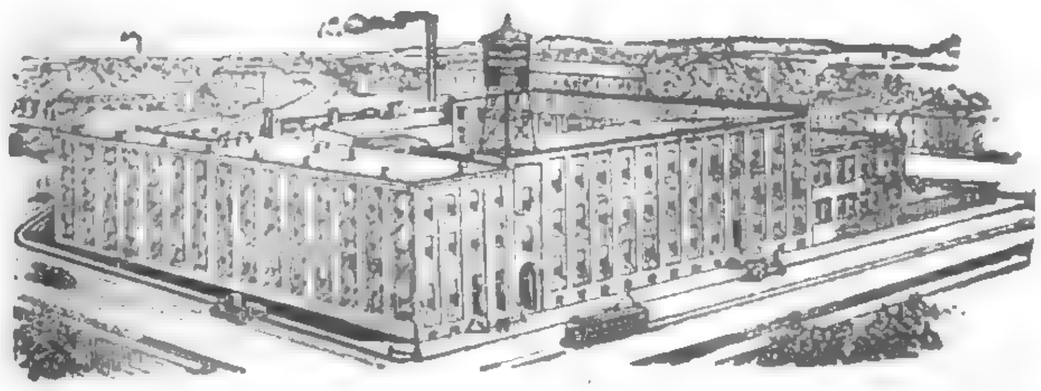


Assortment Y10.—Ten high-grade imitation shell goggles WITHOUT side shields displayed on a heavy, colored artboard with easel. The goggles are sold off this display at a uniform price. Strong shipping container.



Assortment Y15.—Ten high-grade goggles WITH side shields. Assorted styles of imitation shell, white metal and their combinations. Same display board and shipping container.

These assortments have good-quality micoquille lenses in the most popular colors.



WILLSON GOGGLES INC., READING, PA., U.S.A.

British Office and Warehouse: S. PULZER, 9, Hatton Garden, London, E.C.1

Australasian Representative, WILLIAM LEWIS, Ltd., Stafford House, 316, Pitt St., Sydney.

Largest plant in the world devoted exclusively to the manufacture of eye-protective devices. Trade Mark Registered in The United States Patent Office, Great Britain, Australia, France, Brazil, Argentine, Chile, Bolivia, Peru, Uruguay, Cuba and Japan.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

WHOLESALE TRADE ONLY.

W. Smythe & Co. Ltd.

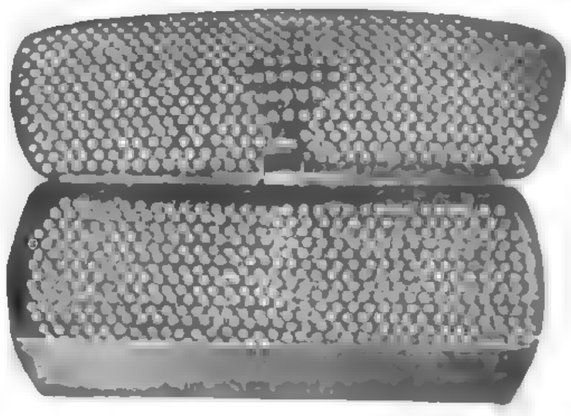
Head Office: 66 and 67, EDWARD ST. PARADE, **Birmingham.**

Branch Works—HOCKLEY and WALSALL.

Patent Optical Case Manufacturers

Telephones: 5587-2354 CENTRAL. Telegrams & Cables: "NOWATE. BIRMINGHAM."

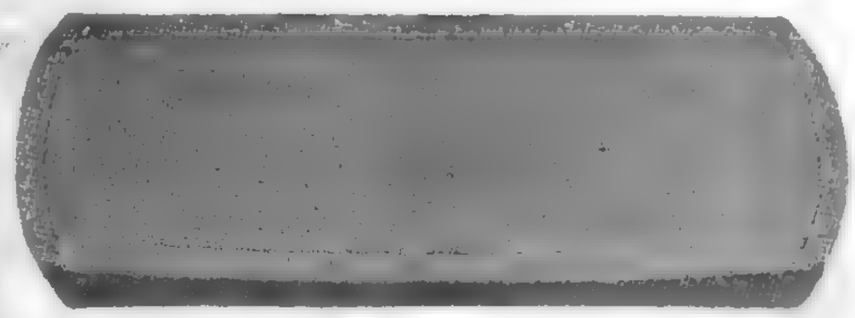
The Patent "NOWATE" Body →



Advantages:

Light as Aluminum and Cheaper.
Stronger than Aluminum and Steel Bodies.
Leather and Lining does Not Peel Off.
Specially Suitable for Export and Hot Climates.

Patent Metal Spring Lid.



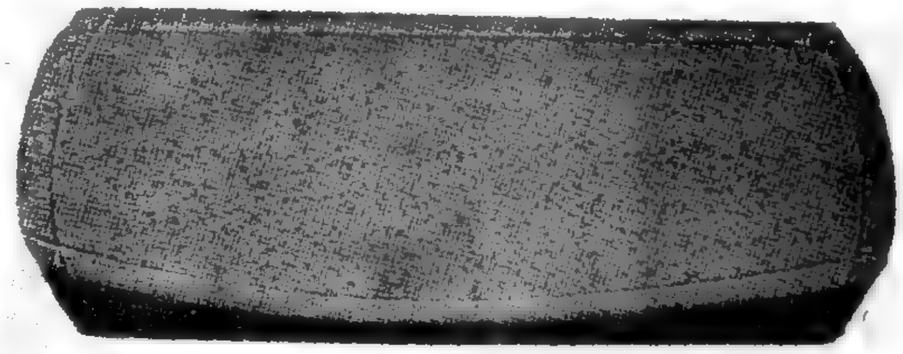
MODEL 5
FINGERPIECE EXTRA LARGE CURLSIDE
2.1.0.EYE



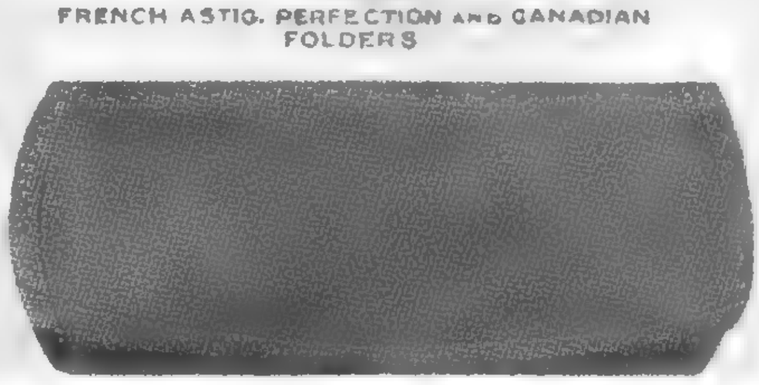
MODEL 4
FINGERPIECE. BOWSPRING RIMLESS
ORDINARY SPIRAL. 2.1.0 EYE



MODEL 6
FRENCH ASTIG. PERFECTION AND CANADIAN FOLDERS



MODEL 3
CURLSIDE 00 EYE. 64 & 66 m/m RD



MODEL 1
ORDINARY SPIRAL TRIPLE BAR 2.1.000 EYE



MODEL 7
ROUND EYE

ILLUSTRATIONS HALF-SIZE. COMPETITIVE PRICES

Also Makers of Frogmouth and Soft Leather Cases. Write for List and Prices.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

made under Part II. of this Act applies, the question shall be referred to the arbitration of a referee, to be appointed by the Lord Chancellor, who shall not be an official of any Government department, and the decision of the referee with respect to the matter in dispute shall be final and conclusive, and sections thirty and thirty-one of the Customs Consolidation Act, 1876, shall apply as if the dispute were a dispute as to the proper rate of duty payable, with the substitution of an application for a reference to a referee under this section for the action or suit mentioned in those sections.

12.—(1) If it is proved to the satisfaction of the Commissioners that a duty of customs has been duly paid in respect of any goods under this Act, and the goods have not been used in the United Kingdom, a drawback equal to the amount of duty paid shall be allowed on those goods if exported as merchandise.

(2) Section six of the Customs and Inland Revenue Act, 1879, shall not apply to goods liable to duties of customs under this Act, and any such goods imported into the United Kingdom after exportation therefrom shall be exempt from duty, if it is shown to the satisfaction of the Commissioners either that the goods had not been imported previously to exportation, or that no drawback of duty was allowed on exportation, or that any drawback so allowed has ben repaid to the Exchequer:

Provided that goods which have been imported and exported by way of transit under bond shall not be deemed to have been imported or exported under this provision.

13. Subject to compliance with such conditions as to security for the re-exportation of the goods as the Commissioners may impose, this Act shall not apply to goods imported for exportation after transit through the United Kingdom or by way of transhipment.

14.—(1) In this Act—

The expression "the Board" means the Board of Trade; and any thing authorised under this Act to be done by the Board may be done by the President, or a Secretary or Assistant-Secretary, of the Board, or by any person authorised in that behalf by the President of the Board:

The expression "the Commissioners" means the Commissioners of Customs and Excise:

The expression "prescribed" means prescribed by regulations made by the Board.

(2) This Act shall be construed together with the Customs Consolidation Act, 1876, and any enactments amending that Act, except that the Isle of Man shall not be deemed to be part of the United Kingdom.

15. This Act may be cited as the Safeguarding of Industries Act, 1921.

16. Part I. of this Act shall come into force on the first day of October, nineteen hundred and twenty-one, and shall continue in force until the expiration of five years from the passing of this Act and no longer.

SCHEDULE, (SECTIONS 1 & 11).

Goods Chargeable With Duty.

Optical glass and optical elements, whether finished or not, microscopes, field and opera glasses, theodolites, sextants, spectroscopes and other optical instruments.

Beakers, flasks, burettes, measuring cylinders, thermometers, tubing, and other scientific glassware and lamp-blown ware, evaporating dishes, crucibles, combustion boats, and other laboratory porcelain.

Galvanometers, pyrometers, electroscopes, barometers analytical and other precision balances, and other scientific instruments, gauges and measuring instruments of precision of the types used in engineering machine shops and viewing rooms, whether for use in such shops or rooms or not.

Wireless valves and similar rectifiers, and vacuum tubes.

Ignition magnetos and permanent magnets.

Arc-lamp carbons.

Hosiery latch needles.

Metallic tungsten, ferro-tungsten and manufactured products of metallic tungsten, and compounds (not including ores or minerals) of thorium, cerium and the other rare earth metals.

All synthetic organic chemicals (other than synthetic organic dyestuffs, colours, and colouring matters imported for use as such, and organic intermediate products imported for their manufacture), analytical re-agents, all other fine chemicals (except sulphate of quinine of vegetable origin) and chemicals manufactured by fermentation processes.

You cannot afford to do without THE OPTICIAN. As a manufacturer you need be acquainted with all published information bearing on design and on workshop technique. As a merchant you require to be kept informed of the latest novelties in spectacle-work and scientific instruments, so that you may be able to deal intelligently with all enquiries on these matters. As a sight-testing optician you want to know what is newest in connection with the refraction of the eye and the prescribing and fitting of spectacles. If you are interested in any way in the optical industry, you must keep abreast of its development by reading the technical and other trade news which is to be found only in THE OPTICIAN.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Geometrical Ophthalmic Optics.—VI.

By WILLIAM SWAINE, B.Sc.

Cardinal Points of a System.

In the third article of this series we gave the simplest calculation scheme for finding the image-position and magnification—given the constants of the several refracting surfaces and the initial vergence of the object. Each surface simply imposed its converging power on the effective vergence after refraction at the preceding surface. The final image vergence was measured from the vertex of the last surface. No attempt was made to involve the expressions by combining them except in the last article in which we considered the combination of two surfaces. The vertex powers and the vertex image vergences were treated there and applied to the particular case of spectacle lenses. Attention was called to the practical value of the results in so far as spectacle lenses are concerned.

Again, in Article III., the vertex vergence scheme was also applied to the tracing of a paraxial ray through the Helmholtz eye. Should an isolated tracing through a number of surfaces only be required, then the scheme is recommended. However, in order to consider the optical action of the eye, for example, or of the eye when aided by a spectacle lens, it will be advisable to reduce the eye to some *equivalent** system. That this is possible is well-known, and we will proceed to demonstrate how to arrive at such an equivalent system.

Principal Point System (Equivalent System).

Consider a system composed of two refracting surfaces of powers D_1 and D_2 defined by $D_1=\frac{n'_1-n_1}{r_1}$ and $D_2=\frac{n'_2-n_2}{r_2}$ where $n_1{}^1=n_2$ and separated by the reduced distance $\delta_2=\frac{d_2}{n_2}$.

Then tabulating the various vergences before and after refraction, we have immediately

$$A_1=A_1;\ A_2=\frac{A_1+D_1}{1-\delta_2(A_1+D_1)}$$

$$A_1{}^1=A_1+D_1;\ A_2{}^1=\frac{A_1+D_1}{1-\delta_2(A_1+D_1)}+D_2$$

$$=\frac{A_1(1-\delta_2D_2)+(D_1+D_2-\delta_2D_1D_2)}{1-\delta_2(A_1+D_1)}$$

The magnification will be given by,

$$m_{1,2}=\frac{A_1A_2}{A'_1A_2{}^1}=\frac{A_1}{(A_1+D_1)}\cdot\frac{(A_1+D_1)}{1-\delta_2(A_1+D_1)}\cdot\frac{1-\delta_2(A_1+D_1)}{A_1(1-\delta_2D_2)+(D_1+D_2-\delta_2D_1D_2)}$$

$$=\frac{A_1}{A_1(1-\delta_2D_2)+(D_1+D_2-\delta_2D_1D_2)} \qquad (35)$$

There will be a pair of conjugate points such that $m_{1,2}$ is unity. Such a pair of points are called *unit* or *principal* points. They possess the remarkable property that a paraxial ray striking a plane through the one point will emerge, not necessarily parallel to its original direction, but from a point in the other 'principal plane' at an equal distance from the axis.

The position of the object side principal point (called for short the 1st H-point) will be given by

$m_{1,2}=1$ or from equation (35)

$$A_1=A_1-\delta_2A_1D_2+(D_1+D_2-\delta_2D_1D_2)$$

$$i.e.\quad A_1=+\frac{D_1+D_2-\delta_2D_1D_2}{\delta_2D_2}$$

From which since $\frac{n_1}{a_1}=A_1$ the reduced distance $\frac{a_1}{n_1}$ will be given by

$$\frac{a_1}{n_1}=\frac{1}{A_1}=+\frac{\delta_2D_2}{D_1+D_2-\delta_2D_1D_2}=h_{12} \quad \ldots \quad (36)$$

The conjugate image point will be, by tracing with the scheme,

$$A_1=+\frac{D_1+D_2-\delta_2D_1D_2}{\delta_2D_2}$$

$$A'_1=\frac{D_1+D_2-\delta_2D_1D_2+\delta_2D_1D_2}{\delta_2D_2}=\frac{D_1+D_2}{\delta_2D_2}$$

$$A_2=\frac{\delta_2D_2}{1-\delta_2\cdot\frac{D_1+D_2}{\delta_2D_2}}=\frac{D_1+D_2}{-\delta_2D_1}$$

$$A_2{}^1=-\frac{D_1+D_2}{\delta_2D_1}+D_2=-\frac{D_1+D_2-\delta_2D_1D_2}{\delta_2D_1}$$

The reduced distance $\frac{a'_2{}^1}{n'_2{}^1}$ will be

$$\frac{a'_2}{n'_2}=\frac{1}{A'_2}=-\frac{\delta_2D_1}{D_1+D_2-\delta_2D_1D_2}=h'_{12} \qquad (37)$$

The power of the combination will be given

* Distinguish between equivalent thin lens, equivalent surface and equivalent system.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Seven Styles

now made in

"OCENTRIC" EYEGLASSES

BRITISH MADE.



A Distinctive Model for Each Individual Taste.

RIMLESS MOUNTS & FRAMES. G.F. & SOLID GOLD.

O series Short Plaquets Regular pattern

100 „ Normal Plaquets Regular Pattern

200 „ Long Plaquets Regular Pattern

300 „ For Centrally Drilled Lenses
(BENT UP PLAQUET ENDS.)

400 „ For Centrally Drilled Lenses
(CLAMPS ATTACHED BY SHORT BRACKET.)

700 „ For Centrally Drilled Lenses
(SWAN NECK BRACKETS.)

800 „ Regular Pattern with Double Straps

SAMPLES and PRICES WILLINGLY ON APPLICATION.

The British Ocentric Optical Co., Ltd.,

Wholesale and Manufacturing Opticians,

12 & 13, EAGLE STREET, SOUTHAMPTON ROW,

LONDON, W.C. 1

Telegrams—Ocentricco, Westcent, London. *'Phone—Holborn 560*

Cables—Ocentricco, London.

C2

Digitized by Google Original from THE OHIO STATE UNIVERSITY

OPTICAL MANUFACTURERS LTD.,

(Incorporating Wheway Optical Co., Ltd.)

WAR TIME CONTRACTORS TO THE ARMY SPECTACLE DEPOT.

THINK OF THE MONEY YOU LOSE every year (and the dissatisfaction given) because your customers bring back Rimless Specs or Eyeglasses complaining that Lenses have worked loose.

This Trouble and Expense can be entirely avoided by using

The New Patent Tied Straps.

Any wholesaler will supply you with Finger Piece or Rimless Spect. Mtgs. fitted with above.

Works at VYSE STREET and GEM BUILDINGS, HOCKLEY HILL, BIRMINGHAM.

London Office: 55, HATTON GARDEN, E.C.1.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

by the effective modification of the vertex powers through these distances (36) and (37).

$$\text{Thus } D_{1,2} = \frac{V_{1,2}}{1 - \frac{a_2}{n'_2} V_{1,2}} = \frac{D_1 + D_2 - \delta_2 D_1 D_2}{1} \quad (38)$$

$$\text{since } V_{1,2} = \frac{D_1 + D_2 - \delta_2 D_1 D_2}{1 - \delta_2 D_1}$$

$V_{1,2}$ = vertex power of the combination 1, 2.

$D_{1,2}$ = principal point power of the same.

In like manner we may show that

$$(+)\, D_{2,1} = (+)\, (D_1 + D_2 - \delta_2 D_1 D_2) \quad (38a)$$

Just as the power of a single surface was independent of the direction so is the principal point power of a combination. As before the reciprocal of a power is the reduced focal distance. If the first and last media have different refractive indices the principal focal distances of the combination will be different (compare refraction at a single surface).

An incident ray parallel to the axis converges to the corresponding focal point from points in the respective principal planes the same distance from the axis as is the incident ray.

In this way we may replace the combination by employing the properties of the principal points and the focal points.

From equations (36) and (37) determine the positions from the respective vertices of the principal points. Also the positions of the focal points either from the vertex powers or principal point power. Indicate them $H_{1,2}$ and $H'_{1,2}$, $F_{1,2}$ and $F'_{1,2}$ as in fig. 8. The positions of the vertices are given by H_1 and H_2. Consider an object PQ. A ray QA_1 parallel to the to the axis, will emerge through A_1' and pass through $F_{1,2}'$ where $H_{1,2} A_1 = H'_{1,2} A'_1$. Reversely $QF_{1,2} A_2$ emerges parallel to the axis as $A_2' Q_1$. Then $P' Q'$ is the image of PQ.

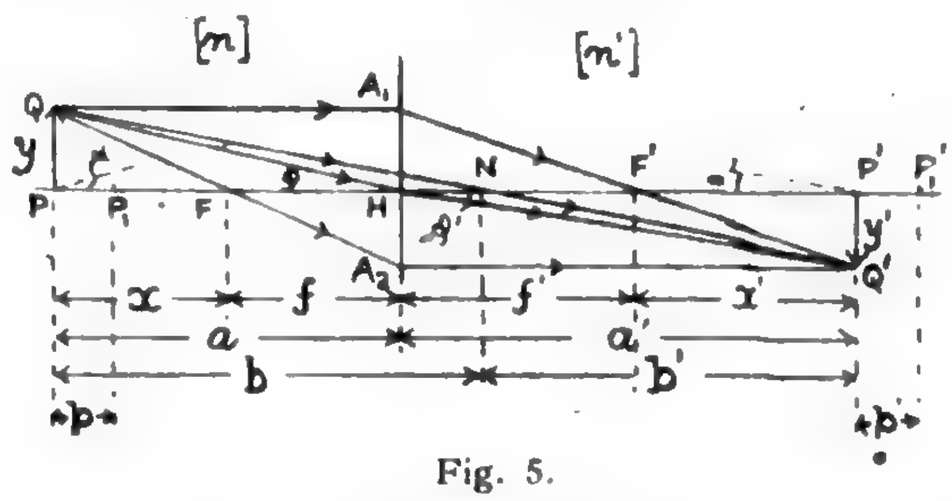


Fig. 5.

Compare this construction with that of fig. 5. The combination acts just like a single surface which has had its principal plane (vertex plane) split and separated by a distance, viz. $H_{1,2} H'_{1,2}$. The part on the object side simply receives the light, that on the image side throws it out. The process is, of course, artificial and intended to aid mathematical investigation. We may regard the matter from two points of view.

(*a*) a single refracting surface is a particular case of a principal point system (with its H-points coincident at the vertex, or

(*b*) a principal point system is a peculiar

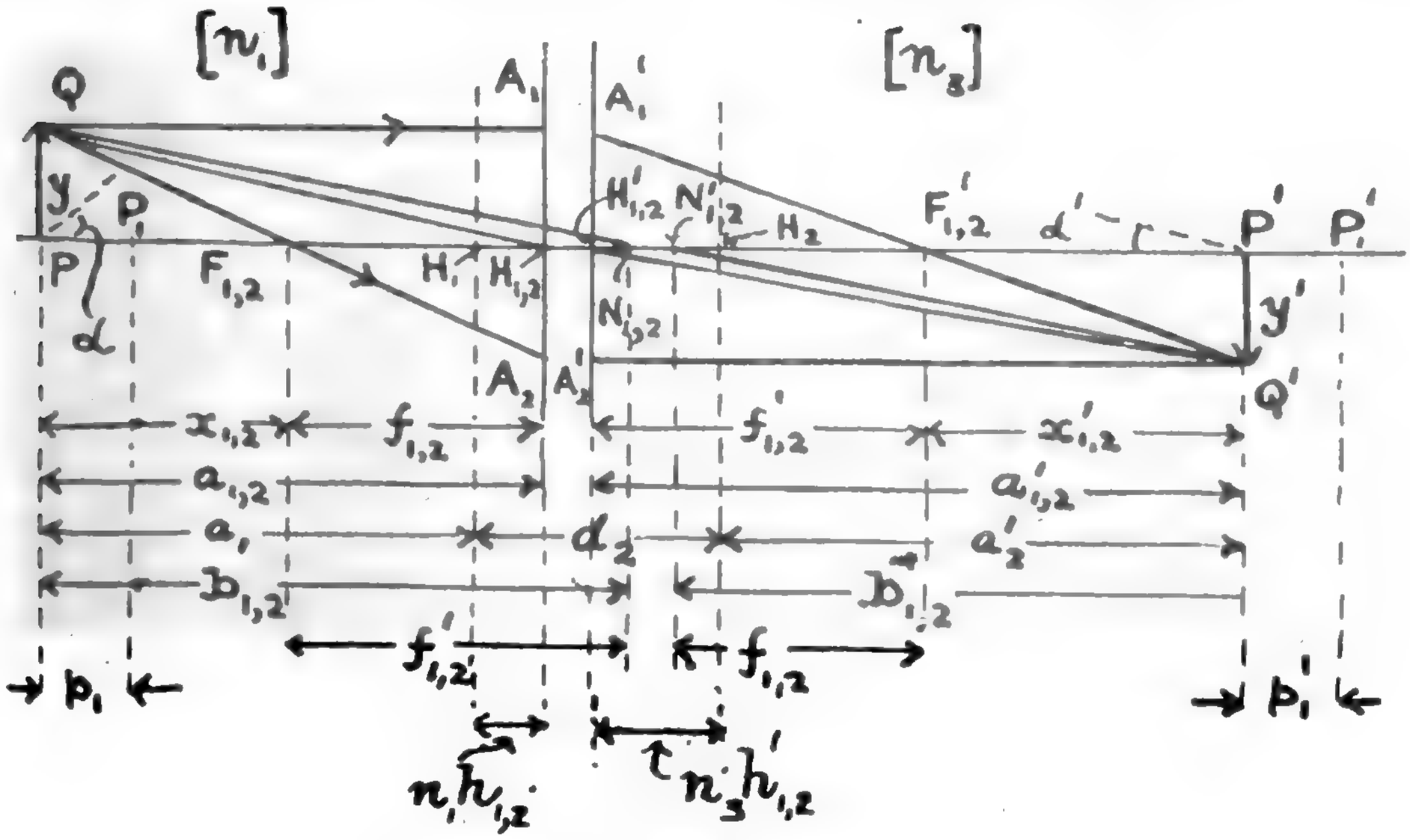


Fig. 8.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

form of a single equivalent system.

Under the necessary conditions we see that everything which has been stated up to the present in this series (we have worked mainly on vertex and single surface relations) may be applied to the principal point system.

The paraxial intersectional formulæ of Articles I. and II. will hold for the combined system. The fundamental vergence equation becomes.

$$A_{1,2}{}' = A_{1,2} + D_{1,2} \quad \dots \quad \dots \quad \dots \quad (20a)$$

where all the quantities are referred to the principal points $H_{1,}{}'_{2}$ and $H_{1,2}$. The paraxial calculation scheme may be applied if we remember that reduced distances refer to the the distances between adjacent points *e.g*, $H_{1,}{}'_{2}$ $H_{1,4}$, etc., and that the power to be added is the principal point power. There is no need to reduce all the parts of the systems to equivalent systems before combining. Vertex systems may be combined with principal systems.

Another pair of conjugate points of particular value, are the *nodal points*, for which the angular ratio is equal to unity (See IV. Lagrange Law in the Calculation Scheme). A ray directed towards the first nodal point will emerge through the second nodal point in a parallel direction. For a single surface, the nodal points coincide with the centre of the refracting sphere.

The simplest and most instructive demonstration of the nodal point positions is to consider the geometry of fig. 8.

Lagrange's Law applied to the combination gives

$$\delta_1 n_1 y_1 = \delta_2{}' n_2{}' y_2{}'$$

$$\text{or } \frac{\delta_1}{\delta_2{}'} = \frac{n_2{}' y_2{}'}{n_1 y_1} = \frac{n_2{}'}{n_1} m_{1,2}$$

For the nodal points, $\delta_1 = \delta_2{}'$

$$\text{or } m_{1,2} = \frac{n_1}{n_2{}'} \quad \dots \quad \dots \quad \dots \quad \dots \quad (39)$$

$$\text{But } D_{12} = \frac{n_2{}'}{f_{1,}{}'_{2}} = -\frac{n_1}{f_{1,2}} \quad \dots \quad \dots \quad \dots \quad (40)$$

Hence by equation (17) we have

$$-\frac{f_{1,2}}{f_{1,}{}'_{2}} = -\frac{f_{1,2}}{x_{1,2}} = -\frac{x_{1,}{}'}{f_{1,}{}'_{2}}$$

or $x_{1,2}{}' = +f_{1,2}$ and $x_{1,2} = +f_{1,}{}'_{2}$

The position of the first nodal point *from the first focal* point is equal to the measure of the *second* focal distance. The power† of the combination referred to the nodal points will be.

$$(+)\,N_{1,2} = -\frac{n_1}{f_{1,2}{}'} = (+)\frac{n_1}{n_2{}'} D_{1,2}$$

$$N_{1,}{}'_{2} = -\frac{n_2{}'}{f_{12}} = \frac{n_2{}'}{n_1} D_{12} \quad \dots \quad (41)$$

or $N_{1,2}\, N'_{2,1} = D_{12}{}^{2} \quad \dots \quad \dots \quad \dots \quad \dots \quad (52)$

To the reader who desires to enquire further into the question of the combination of systems from a general point of view, the following references in English will prove instructive. The sign convention employed in each case is that adopted in this series and the terminology and designations differ only in minor details.

"Dioptric Instruments." Ferraris (Translation by Oscar Faber; Published by H.M. Stationery Office). Geometrical Treatment.

"Applied Optics," Dr. C. V. Drysdale. 'The British Optical Journal.' Curvature (or Dioptral) Treatment.

"The Power of a Lens System," Theodore Chaundy, M.A. *The Optician*, November 9th, 1917. A Mnemonic for writing Cotes' formula.

"Another Mnemonic," ibid. Jan. 4th, 1918.

"The Focal Length of a Composite System" ibid. Sept. 27th, 1918.

"Two Lens Combinations." ibid. Jan. 31st, 1919.

"Mirrors, Prisms and Lenses," J. P. C. Southall. Published by Macmillan. This book is strongly recommended to those opticians who desire to pursue a study of ophthalmic optics from the continental point of view.

"Geometrical Optics," R. A. Herman, M.A. Cambridge University Press.

Principal Point—Power and Position—Calculation Scheme.

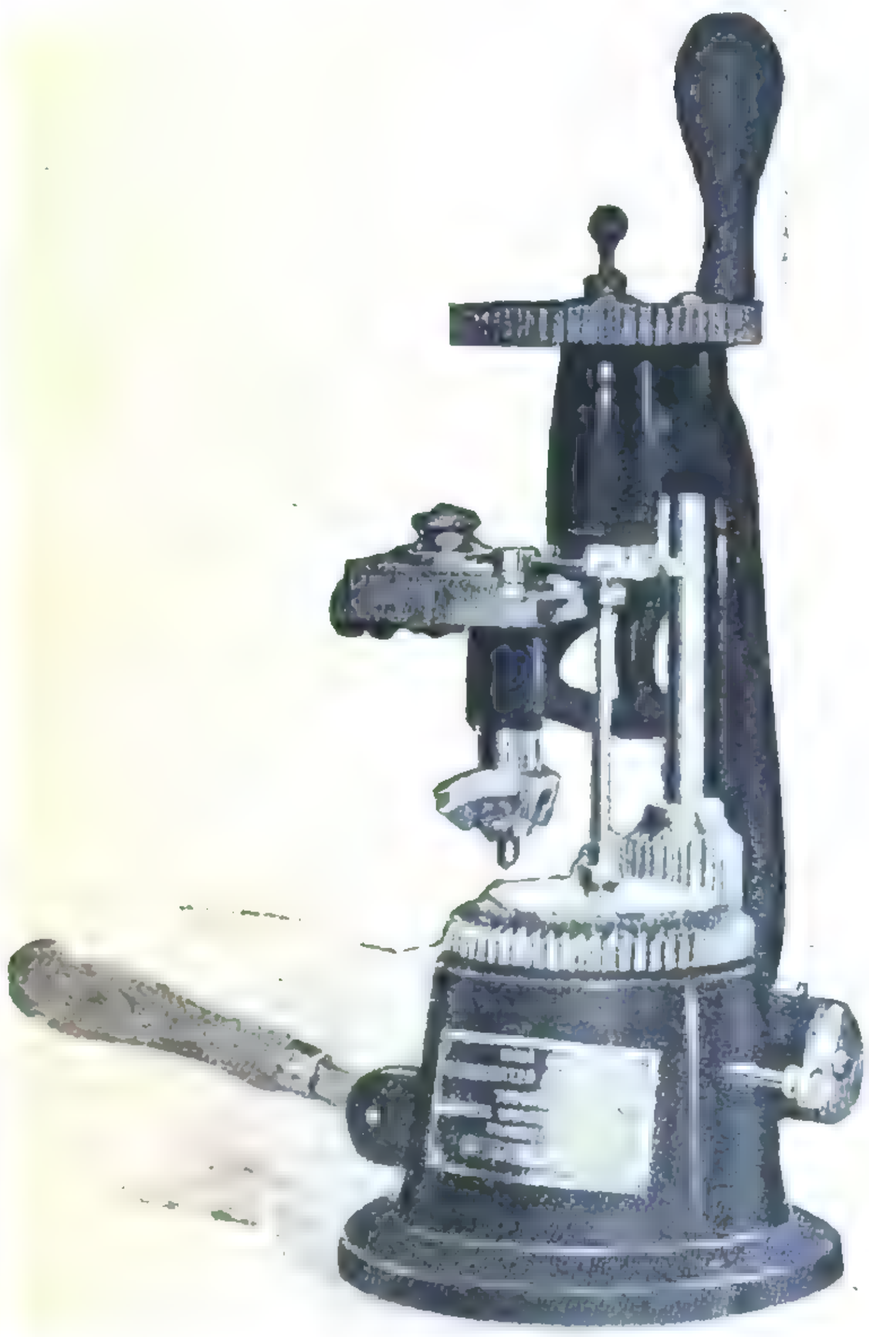
Just as in the case of the vertex vergence calculation scheme we saw that for facility of calculation and of future reference, it was advisable to follow a definite routine of calculation, so in this case, the calculation of the principal point powers of the whole system and of *important parts* and of the positions of the principal points of the same, we offer a suggestive table.

Whilst the scheme is a little more cumbersome than the 'step by step' method of Mr. Chaundy ("The Focal Length of a Composite System," see above) for calculating the whole principal point power, yet we shall find that when dealing with actions within the eye, a knowledge of the power of the parts (*e.g.* crystalline lens in the humours) will be useful. A little foresight exercised in planning out such a calculation scheme and in suitably filing the

† Quite distinct from the nodal point power of Gleichen. The above power refers to the effective principal power at the nodal points.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY



The

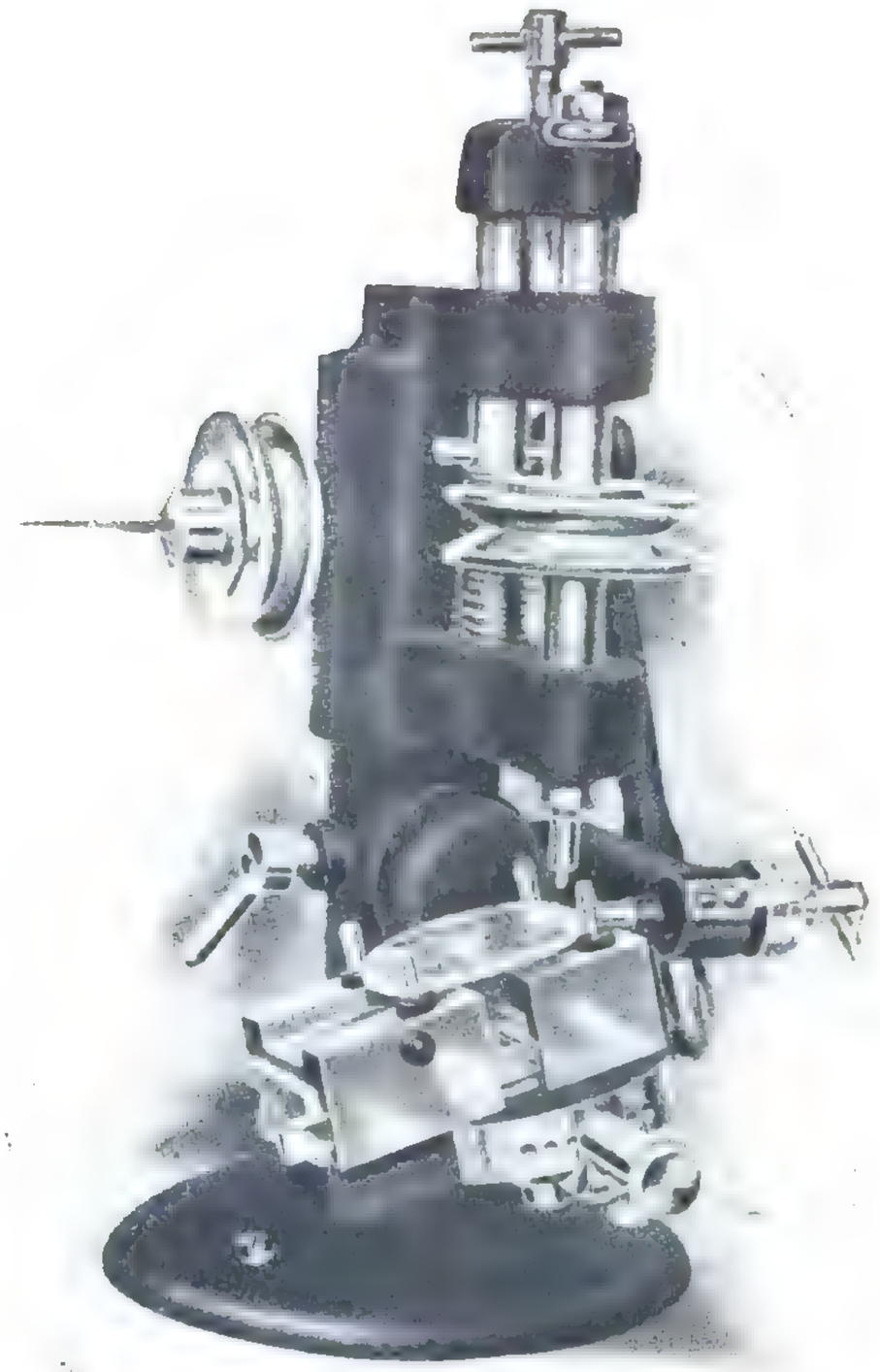
"Consol" Lens Cutter.

There are "Lens Cutters" and there is the "Consol" Lens Cutter and that's the difference.

The "Consol" has been built by Mechanics who know their work, and who have more than a fleeting knowledge of what a Lens Cutter has to do.

In consequence they have evolved a machine which for efficiency, simplicity, accuracy and strength, cannot be surpassed.

The tilting attachment supplied on a "Consol" Cutter is readily set to cut any lens, being made so that it permits setting at a perpendicular to the curve of Lens.



The

"Consol" Lens Drill.

The modern large Prescription Plants can only carry on by using the finest machines, and this "Consol" Drill is found in every up-to-date works. One testimonial says—"Your 'Consol' Lens Drill is a beauty, and the more I use it, the better I like it."

The "CONSOL" MACHINERY includes SENIOR and JUNIOR AUTOMATIC LENS EDGING MACHINES, COMPLETE OPTICAL WORK BENCHES, DRILLS, CUTTERS, SURFACERS and particulars of any class of our machines can be obtained from ANY WHOLESALE OPTICAL HOUSE, or from

THE GENERAL OPTICAL Co., (E. T. & F. W. Cornwell),

32, ELY PLACE, HOLBORN, LONDON, E.C.1

Who are the sole distributors of "CONSOL" Machinery Products.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

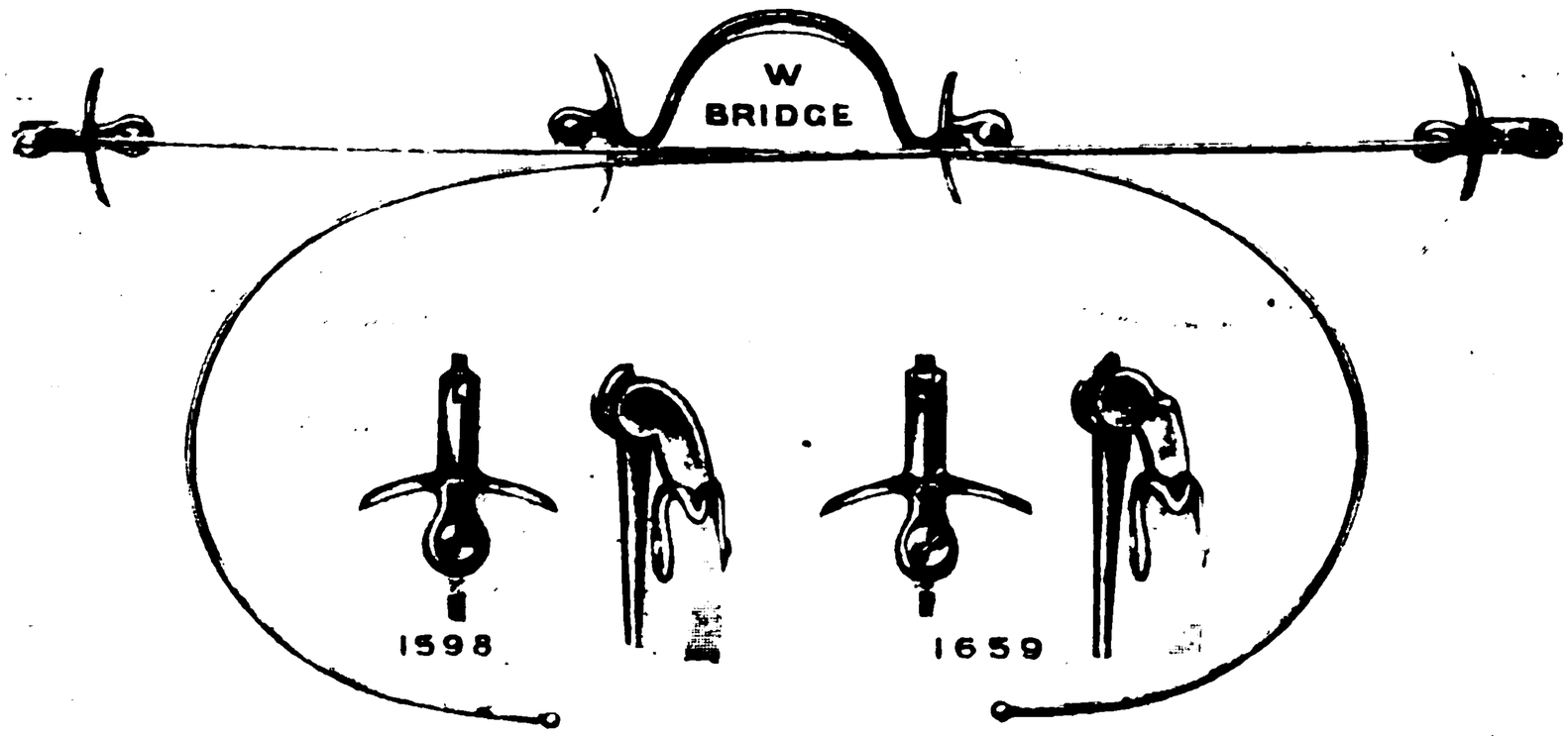
QUALITY FIRST

DUPAUL, YOUNG OPTICAL CO.,

ESTABLISHED 1888.

SOUTHBRIDGE, MASS., U.S.A.

Manufacture only Guaranteed Quality and Best Finish Gold-Filled and White Metal Spectacles, Eyeglass Frames, Astigs, Mountings and Materials.



To be obtained from all Wholesale Optical Houses.

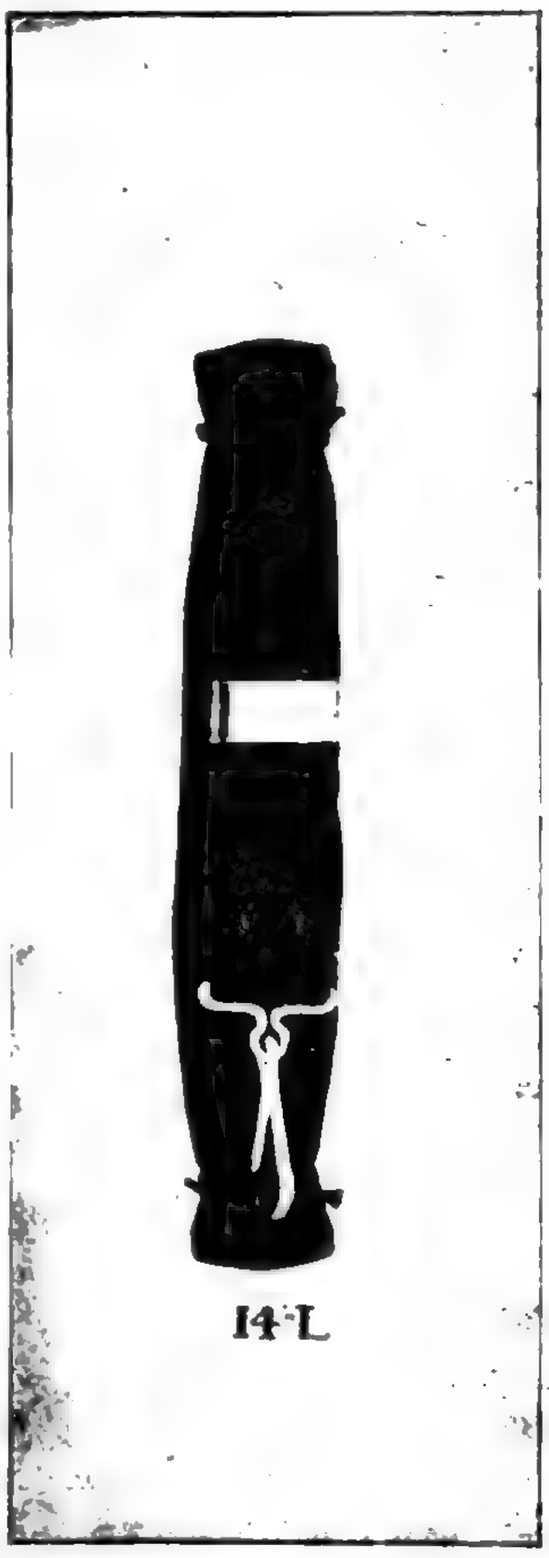
LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"BISHOP QUALITY"

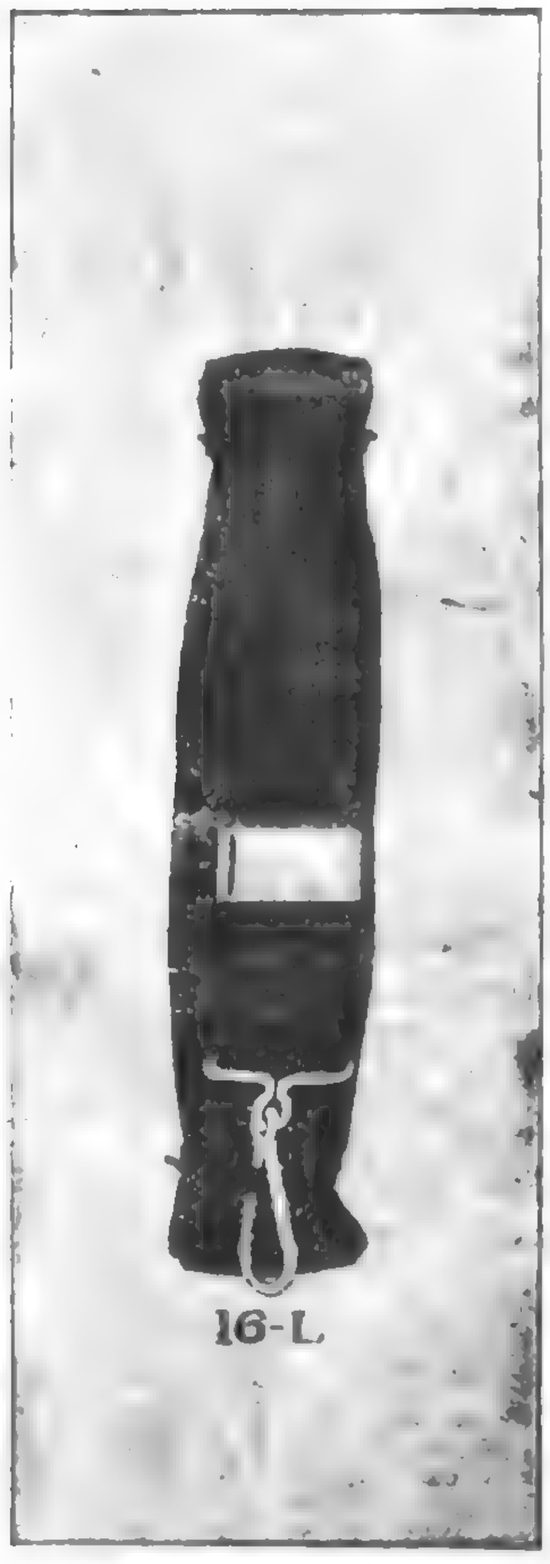


14-L

SILK EYEGLASS CORDS AND MONOCLE RIBBONS.

With Gold Filled, Silver or Gun Metal snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.



16-L

THE BISHOP COMPANY,
North Attleboro, Mass., U.S.A.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

"You Cannot SQ MARK Buy Better"

STEVENS' QUALITY
Optical Goods

UNQUALIFIED approval meets this celebrated line wherever introduced.

WE are sole agents for the United Kingdom and can invariably supply your requirements from stock.

One Quality Only—The Best Made

1/10th 12ct. Gold Filled

Specialising in the Fingerpiece Mount

Send us your enquiries for
Spectacles and Eyeglasses—Frames and Mountings

Complete Catalogues on Application

H. WILLIAMSON Ltd.
Optical Section
87/89 GREAT SAFFRON HILL, LONDON, E.C.1

General Optical Supplies—Prescription and Repair Work—
Fittings and Instruments—Optical Machinery

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

results will save endless duplication in subsequent calculations and render the detection of arithmetical errors easier.

Principal Point Calculation Scheme.

	$\delta_3 =$	$\delta_5 =$	$\delta_7 =$
$\delta_2 =$	$\delta_4 =$	$\delta_6 =$	$\delta_8 =$
$D_1 =$	$D_3 =$	$D_5 =$	$D_7 =$
$D_2 =$	$D_4 =$	$D_6 =$	$D_8 =$
$-\delta_2 D_1 D_2 =$	$-\delta_4 D_3 D_4 =$	$-\delta_6 D_5 D_6 =$	$-\delta_8 D_7 D_8 =$
$D_{1,2} =$	$D_{3,4} =$	$D_{5,6} =$	$D_{7,8} =$
$h_{1,2} =$	$h_{3,4} =$	$h_{5,6} =$	$h_{7,8} =$
$h'_{1,2} =$	$h'_{3,4} =$	$h'_{5,6} =$	$h'_{7,8} =$
$\delta_{1,4} = \delta_3 + h_{3,4} - h'_{1,2} =$		$\delta_{5,8} = \delta_7 + h_{7,8} - h'_{5,6}$	
$D_{1,2} =$		$D_{5,6} =$	
$D_{3,4} =$		$D_{7,8} =$	
$-\delta_{1,4} D_{1,2} D_{3,4} =$		$-\delta_{5,8} D_{5,6} D_{7,8} =$	
$D_{1,4} =$		$D_{5,8} =$	
$h_{1,4} =$		$h_{5,8} =$	
$h'_{1,4} =$		$h'_{5,8} =$	
$\delta_{1,8} = \delta_5 + h_{5,8} - h'_{1,4} =$	$H_1H_{1,8} =$	$f_{1,8} =$	
$D_{1,4} =$	$H_1H'_{1,8} =$	$f'_{3,8} =$	
$D_{5,8} =$	$H_1F_{1,8} =$	etc.	
$-\delta_{1,8} D_{1,4} D_{5,8} =$	$H_1F'_{1,8} =$	ad lib.	
$D_{1,8} =$	$H_1N_{1,8} =$		
$h_{1,8} =$	$H_1N'_{1,8} =$		
$h'_{1,8} =$			

Principal Point Calculation Scheme.

Example:—

Calculation of the Cardinal Points of the Helmholtz Schematic Eye.

From Article III. (June 3rd, 1921) of this series for the Helmholtz schematic eye, we transfer the following constants.

$n_2 = 1.3365$ $n_3 = 1.4371$ $n_4 = 1.3365$

$\delta_2 = .002693$ $\delta_3 = .002505$

$D_1 = 42.982$ $D_2 = +10.06$ $D_3 = +16.77$

We then proceed with the principal point calculation scheme below.

Comment may be desirable with regard to the obtaining of the positions of the cardinal points from the vertex of the first surface (the cornea).

$H_1H_{1,3}$. $h_{1,3}$ is measured from the first principal point of the first principal system (D_1). Thus

$$H_1H_{1,3} = h_1 + h_{1,3}$$

$H_1H'_{1,3}$. $h'_{1,3}$ is measured from the second principal point of the second principal system (whole crystalline). This latter is also measured ($h'_{2,3}$) from the posterior surface of crystalline. Both $h'_{1,3}$ and $h'_{2,3}$ are the reduced distances in the final medium $n_3 = 1.3365$.

Hence $H_1H'_{1,3} = d_2 + d_3 + (h'_{1,3} + h'_{2,3})\, n_3$.

$f_{1,3}$ is the front focal distance, is measured in air and

$$\frac{n_1}{f_{1,3}} = -D_{1,3} = \frac{1}{f_{1,3}} \text{ or } f_{1,3} = -\frac{1}{D_{1,3}}$$

$f'_{1,3}$ the posterior principal focal length and is equal to

$$f'_{1,3} = -n_3 f_{1,3}$$

Knowing the position of the principal points and the focal distances the positions of the focal points or nodal points are readily obtained.

Cornea	Crystalline
$D_1 = +42.982$	$D_2 = +10.06$
	$D_3 = +16.77$
	$-\delta_3 D_2 D_3 = -0.42$
	$D_{2,3} = +26.41$
$h_1 = 0$	$h_{2,3} = +0.00159$
$h'_1 = 0$	$h'_{2,3} = -0.00095$
$\delta_{1,3} = \delta_2 + h_{2,3} - h'_1 = .004283$	

Whole Eye

$D_1 = +42.982$	$H_1H_{1,3} = +1.754$ mm.
$D_{2,3} = +26.41$	$H_1H'_{1,3} = +2.110$,,
$-\delta_{1,3} D_1 D_{2,3} = -4.85$	$H_1F_{1,3} = -13.75$
$D_{1,3} = +64.52$	$H_1F'_{1,3} = +22.82$
$h_{1,3} = +0.001754$	$H_1N_{1,3} = +6.96$
$h'_{1,3} = -0.00286$	$H_1N'_{1,3} = +7.32$
$f_{1,3} = -15.5$	$f'_{1,3} = +20.71$

In the Birmingham County Court, Judge Amphlett, K.C., awarded damages of £25 to Messrs. Harrison's, Ltd., in an action against Mr. Edgar Wilfred Stephenson, who had been in Messrs. Harrison's employment, and subsequently commenced business on his own account in premises next door. Breach of contract by the defendant was alleged.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Measurement of Solid Impurities in the Atmosphere.

The exerpts below are taken from an article by Sir Napier Shaw, F.R.S., in the 'Times' recently. The calorimetric method, although by no means new in chemical analysis, is claimed to be novel as regards the estimation of impurities in air. It is dependent on direct vision judgment as to carbon content mainly, and might be easily and perhaps interestingly supplemented by examination of photographic or *x*-ray prints from the filter paper "traces." Sir Napier Shaw writes:—

"Public interest has been aroused by the clearness of the atmosphere of London during the restriction of its coal supply. And not only in London has extraordinary clearness been noted; in the monthly weather report of the Meteorological Office for June we find that 'remarkably clear atmospheric conditions prevailed during the latter part of the month.' An observer at Deal reported 'a degree of visibility hardly ever remembered here by the present generation.' At Folkestone on the 19th the fields and trees on the French coast could be distinguished with the naked eye. It is an interesting question how far the clearness of the atmosphere, which all Londoners have appreciated is due to the curtailment of the supply of coal and how far it was due to the exceptional nature of the weather. The interest in the question is accentuated by the obvious fact that in so far as the improvement of the atmosphere is attributable to the lack of raw coal the improvement can be made permanent by suitable arrangement for the supply of smokeless fuel.

"In answering a question on the subject the Minister of Health explained that the condition of the atmosphere of London and elsewhere was being cared for by a Committee of the Ministry, but he made no reference to the work of the Advisory Committee on Atmospheric pollution which is attached to the Air Ministry, through the Meteorological Office. The nature and amount of the impurity of the air of London and other localities has been the subject of investigation by that Committee since 1912, when it was appointed, as a private enterprise. Subsequently the Committee was attached to the Meteorological Office at the behest of the Department of Scientific and Industrial Research in order to comply with the standing orders for a grant from the department towards its incidental expenses.

"The committee has organised the collection and analysis of the impurity collected in 'standard gauges' exposed in many towns and also in open country. We have thereby learned to expect that in the course of a month a gauge in London would collect 'solid' impurity, either in the form of tar, soot, and dust, or brought down in solution with the rain as sulphates, &c., to the extent of 13.41 metric tons per square kilometer, whereas in the open country near Malvern, the average total amount collected monthly is only 2.56 metric tons per square kilometer; of which only 0.16 is tar, soot, or other form of carbon and 1.97 soluble solids. In the tables which have thus been published much interesting information is set out respecting the amount of 'solid' impurity which settles from the atmosphere in the course of a month upon an area exposed in various situations within or near the great towns and in the open country.

A New Instrument.

"A more recent achievement of the committee is an instrument for determining the amount of solid impurity in the air, at any time, by drawing a fixed volume of air, about two liters through a small circular area of filter paper. It takes about ten minutes to operate the filtration of one charge of air; and the instrument renews automatically the charge and the filtration, through a new circle on the filter paper, as soon as one charge is disposed of; and thus the collection of impurity on successive circles of the filter-paper, arranged in a ring, is repeated automatically some seventy times in the twenty-four hours. In this way an automatic record is obtained of the amount of impurity and its variation throughout the day. The record is continued by putting in a new filter-paper at the completion of twenty-four hours.

"The amount of impurity thus collected is estimated by the depth of shading of the successive small circles on the filter. They are compared with a standard scale of shades which are indicated by the numbers 0.20. When the day's record is removed from the instrument the number of the shade for each of the twenty-four hours is noted. The standard scale has been calibrated by comparison with much larger areas of filter-paper which have been darkened by the transpiration of measured volumes of air sufficiently large to give a deposit that could be weighed. It has thus been ascertained that by multiplying the number of the shade by .32 we obtain the number of milligrammes of impurity per cubic meter, or multiplying by .54 we get the num-

Digitized by Google Original from THE OHIO STATE UNIVERSITY



CHEMICO CLEERVIEW

EVERY SPECTACLE USER NEEDS IT —

is the invention of a Spectacle user who realized that sight might be considerably improved by the

SCIENTIFIC CLEANSING

and polishing of the lenses of

SPECTACLES, EYEGLASSES, Etc.

IT RETAILS AT ONE SHILLING.

Polishing the lenses by the usual method with the pocket handkerchief does not give that clear view and power of which the glasses are capable.

EVERY OPTICIAN SHOULD STOCK IT —

In the atmosphere in which we live (both indoors and outdoors) are greasy, tarry products which deposit themselves on the glasses and **"BLUR"** the sight.

SAMPLE SENT FREE ON REQUEST

These products are not soluble in water and are not removed by the handkerchief.

BIG BUSINESS IS BEING DONE —

CHEMICO CLEERVIEW

is a perfect cleanser and polisher and has also the peculiar property of preventing fogging and steaming.

BUT BIGGER BUSINESS IS COMING—

WRITE FOR LITERATURE AND TRADE TERMS.

THE COUNTY CHEMICAL Co., Ltd., Chemico Works, Birmingham.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Getting More Business —NOW

SKILFULLY-WORDED messages of appeal displayed in your windows and inserted in your local newspapers serve to bring your service before a constantly increasing public.

Advertising such as this requires your personal attention and time. Unless your method of dealing with orders is right. you are apt to find yourself constantly working against the clock.

By accepting our assistance in the execution of your Rx orders, you allow your personality to exert itself to the uttermost in the cementing of cordial relations with customers, old and new.

Comparatively no time is lost by allowing us to fill the order. The moment it is delivered here it is given the attention of a principal and, with practically no delay whatever, a qualified staff is working on the job.

The **L.O.C.** equipment, including the latest type of plant and appliances, under expert supervision, guarantees a satisfactorily high standard of work.

And our charges are strictly moderate, so why not make a note to try us on your next Rx order?

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris, France.

Also at—2, Str-Bursei, Bucharest, Roumania.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

ber of pounds of impurity in a million cubic yards, a mode of expression for atmospheric impurity which is used in the Daily Weather Report of the Meteorological Office.

"The filtering operations are conducted by the continuous action of a water-supply, and a clock is used to move on the disc of filter-paper when the action of the water used for aspirating sets it free. The instrument was designed and the original model constructed by the honorary secretary of the committee, Dr. J. S. Owens. It was brought into use at his office at 47, Victoria Street, in the spring of 1920. A supply of instruments has been constructed by Messrs. L. Casella and Co., Ltd., for distribution; and the apparatus is now in regular operation at the Meteorological Office, South Kensington, at Richmond (Kew Observatory), at a station of the London County Council, at Rochdale, and at Glasgow.

"The measurements of the impurity which is to be found at the end of the month in an exposed gauge, and of that which can be filtered from a specimen of air in ten minutes are noteworthy as the first series of systematic observations of the pollution of the air of London and other centres of population. It has been a subject of public interest from time immemorial, generally on account of the murkiness of the atmosphere, but never more so than during the present year on account of the clearness.

Diffusion of Fine Dust.

"The first conclusion from the measurements with the filter is one which at first mention may be rather surprising, though it will be admitted by all those who have to keep papers in London. It is that doors and windows do nothing to keep out the fine dirt that is carried by the air. At first it was supposed that to get a proper sample of air for examination it would be necessary to conduct it directly from the street to the instrument; but experience showed that no such contrivance was required; the air that found its way to the instrument in a closed room was no less and no more dirty than the air of the street, and now we do not trouble even to open windows to let the dirt in. It finds its own way, as common experience teaches us, even to the deep recesses of secluded drawers.

"We have found out from the figures for November, taking them to represent winter conditions, that the dirt of Sundays is two-thirds of week-day dirt, and we conclude that so far as Westminster and South Kensington are concerned two-thirds of the dirt in the atmosphere may be attributed to domestic operations and one-third to the industrial operations of railways, factories, etc. Another of the results of the investigation is that, compared with the winter months, the air in our spring and summer months in London is so clean that we have to concentrate the filteration of the instrument upon a smaller circle in order to get a shade that can be estimated satisfactorily. That again shows that the domestic problem is the more urgent one."

The Protection of British Industry.

Rather at long last, we are able to reprint the text of the Safeguarding of Industries Act, which comes into force on the 1st prox. Practically all of our readers are interested directly or indirectly in the provisions of this Act; and it is very necessary they should be available for reference in the file of *The Optician and Scientific Instrument Maker*. Of general comment on the purpose of the Act enough has been printed in our recent back numbers. The interpretation is clear enough from the wording of the clauses, generally speaking. Much interest will attach in certain quarters to the definitions which will be formulated under Section 1 (5) as to what is to be held to be included under "other optical instruments" in the Schedule. It can be argued, conclusively we think, that a pair of spectacles is an optical instrument. But what about a single spectacle frame? Is a microscope stand, including tubes and adjustments, stage and all mechanical accessories, but without the objective and eye-piece lenses, to be defined as an optical instrument? These questions indicate a line of thought that is being pursued. It remains for those interested to bring forward, not by uncertain and very likely ineffective backstairs methods but publicly, such arguments as they wish to submit to the Board of Trade, with reference to questions so important as those just indicated. In the old days, meaning before the War, one of the great complaints of the British scientific instrument and ophthalmic manufacturing industries, had to do with German competition. Now it is obvious that under the two principal parts of this Act all optical or ophthalmic instruments, and other scientific instruments including chemical, electrical, metrological and (presumably, because barometers are specified) meteorological apparatus imported from Germany, is subject to a protective duty of not one-third but two-thirds of the value of the goods. It is to be expected that manufacturers of such goods

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

within the British Empire will rise to a full appreciation of the encouragement thus offered them, and will realise its advantages practically. There are indeed suggestions mooted already as to ways in which the intention of the Act might be interfered with. For instance, someone has suggested that German manufactures might be imported into Canada, and there supplied with certain lenses of the equivalent of twenty-five per cent. of the "value of the goods," to be subsequently exported to the United Kingdom. But we do not believe that any Canadian manufacturer would lend himself for a moment to a subterfuge of this kind. Important and satisfactory provisions of this Act are those included in Sections 12 and 13, which safeguard the entrepôt trade of British exporting houses. Given this necessary safeguard, the world-wide distributive trade of our British houses is guaranteed, as far as economical conditions can do it, by the course of the world's shipping, conditioned by the exceptional geographical position of these islands,, and the necessary maritime service for direct imports from all four quarters of the globe.

New Volume by Dr. Sheard.

"Transmission of Radiant Energy by Ophthalmic Glasses and the Ocular Media," is the title of a new volume by Dr. Charles Sheard, which, we learn from the current issue of 'Wellsworth,' is just off the press. This volume has to do with the transmission of ultra-violet, visible and infra-red radiations through all manner of ophthalmic glasses and the eye. The volume contains nearly 100 pages and is illustrated with 80 diagrams. The book is divided into four chapters: the chapter headings are: Radiant Energy; Common Methods of Producing and Investigating Ultra-violet, Visible and Infra-red Radiations; Transmission and Absorption of Glass for Ultra-violet, Visible and Infra-red Radiation; Transmission of the Ocular Media. Amongst the topics discussed are: Nature and distribution of radiant energy, wave-lengths of light, spectrum of radiation, radiation and light sensations, spectrographs, infra-red spectrum, experimental apparatus for testing the infra-red transmission of glasses, spectra of illuminants, transmission in the ultra-violet of representative types of ophthalmic glasses, the infra-red and early experiments therein, the infra-red transmission of various types of glass, the transmission of the ocular media in the ultra-violet and visible, experiments on the transmission of the ocular media for the infra-red, and the matter of energy density in the eye.

The volume is handsomely bound in cloth and is of the same size as the author's book on Physiological Optics and Dynamic Skiametry. Copies may be had through the wholesale optical houses and from the publishers of *The Optician and Scientific Instrument Maker*, price 11s. 6d. in London; and further information can be obtained from the American Optical Company, Ltd., 39, Hatton Garden, E.C.

This is the first volume, in so far as we know, to make its appearance on the subject matter treated. It will, therefore, appeal to the progressive practitioner and to the student and will be eagerly received by those who are desirous of keeping abreast of all phases of science that have an application to the field of ocular refraction and the care of the eye.

World's Largest Telescope.

According to current newspaper reports, Prof. David Todd, of Harvard, under the patronage of an American millionaire, Mr. McAfee, is to construct a gigantic telescope for observation of the planet Mars in 1924. Prof. Todd has found a mineshaft, 50ft. in diameter at Chanaral, Chile, where Mars will be at the zenith several times during that year. The objective mirror at the bottom of this shaft will be a flat iron dish 50ft. in diameter, in which mercury will be poured—the rotation of the disc giving the necessary concavity to the fluid surface. It may be remembered that a fluid mercury mirror curved by the operation of centrifugal force was described before one of the scientific societies some 15 years ago; and it had been suggested by a writer in these columns at a still earlier date.

"Chemico" Cleerview.

Every optician knows that there is a marked difference between the sharpness of the visual image when trial and spectacle lenses are quite clean and otherwise. Most spectacle users become aware of the same fact (perhaps somewhat dimly) and polish their lenses at times, probably by means of a handkerchief. It is not an effective method, because the slight veil of greasy or tarry deposits from the atmosphere is not wholly removed. The handkerchief method only distributes it in part in a thinner, more transparent layer. The greasy deposit (to which also very fine dust is

Digitized by Google Original from THE OHIO STATE UNIVERSITY

ARE YOU PUSHING

Chance's A2 Crookes?

We are. It is increasing our sales and bringing new customers.

Let us send *you* samples.

Show it to *your* clients.

Increase *your* sales.

Send for the W.O.W. price list.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY:
DUDDEN HILL LANE, N.W.10

THE REPAIRING OPTICIAN

By JOSEPH FRAY, *Practical Optician.*

F'cap. 8vo (6¾ + 4¼). Cloth.

110 Figures. pp. vi + 183. 8/6 net. Post Free 8/10.

¶ This book is intended to help beginners, apprentices and amateurs to overcome many of the smaller problems for the solution of which they might look to larger text-books in vain. The subjects dealt with include tools; the making and tempering of small tools; frames; repairs; rimless lens mounting, and lenses.

HENRY FROWDE, HODDER & STOUGHTON,
The Lancet Building, 1 & 2, Bedford St., London, W.C.2

RADIUM COMPOUND

SELF-LUMINOUS.

Highest Possible Efficiency, Durability and Value.

As supplied to H.M. Government, &c.
Guaranteed to pass N.P.L. requirements.
All Grades in stock, from 15/- per gram.
RADIUM SALTS TESTED AND CERTIFIED.

F. HARRISON GLEW THE RADIUM LABORATORY,

156, Clapham Road, London, S.W.9

A Thermometer of Character

Reproduction of an Antique design, Plain red spirit tube, lacquered brass scale on period finish Oak mount.

SHORT & MASON LTD.,

Scientific Instrument Makers,

Aneroid Works, WALTHAMSTOW, LONDON, E.17

Write for particulars and general booklet.

No. 3710 (half size).

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

WILLIAM GOWLLAND (1916) Ltd.

MORLAND ROAD, CROYDON.

LONDON. **PARIS.**

WHOLESALE ONLY.

Telephone—463 Croydon
2 lines 464
Awarded 2 Gold Medals, Brussels, 1910.

Telegrams—Fundus, Croydon.
Cables—Gowlland, London.
Grand Prix and Gold Medal, Turin, 1911.

Ophthalmic Lenses, Optical, and Surgical Instrument Manufacturers.

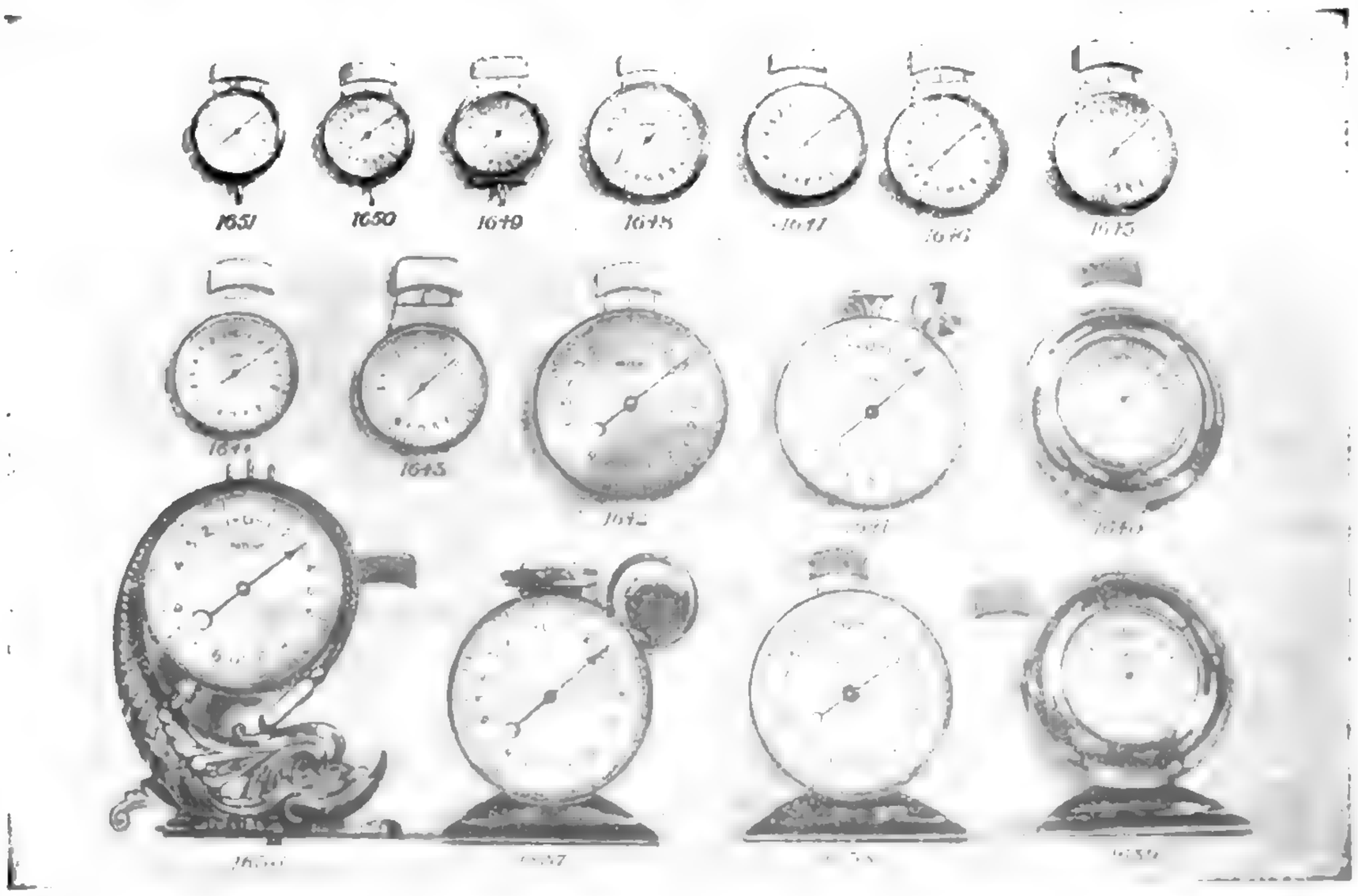
LENS MEASURES.

These Lens Measures are made in our own Factories, and by British Labour.

We hold stocks of "Baby," "Corrugated," "Ordinary" and "Model de Luxe" with readings of 10.D and 20.D also Bi-Focal Measures.

Other patterns made to order.

We have the finest machinery possible for the manufacture of our Uncut Lenses and we hold large stocks of all sights in Sph. Cyls.



Ask your Wholesale House for Samples.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

adherent) is not soluble in water; and hence the advantage of a new product "Chemico Cleerview" just put on the market by the County Chemical Co., Ltd., Chemico Works, Birmingham, which removes the obstruction to sight by a light touch that cannot effect the polish of the lens. At the same time it prevents fogging or steaming of the glasses, thus securing in the full sense a clear view. Chemico Cleerview is being advertised, and it will be to the interest of ophthalmic opticians to co-operate in its sale to the public. (The retail price is 1s.) An advertisement of this useful article appears elsewhere in our present issue, and free samples are offered to our readers with literature and trade terms.

Questionable Annealing.

Several correspondents have drawn our attention to an article in the 'Daily Mail' of Thursday, last week, dealing with the making of spectacles. We have not space for more than the following excerpt:- "This glass is cut into various shapes, a few inches in diameter, and is then placed in a small furnace till red-hot, when it is lifted into moulds—oval, round or oblong—and pressed down to take the curve required when moulded, after which the lenses are immersed in hot water." Whether the last mentioned operation is meant to refer to annealing, the writer of the article, "A Lens Worker," does not say.

Pair of Spectacles from the Continent.

According to the 'Star' of Tuesday evening last, "A man at Peterborough ordered a pair of spectacles from the continent, but they were broken when they arrived." Correspondence ensued with a Post Office official, who wrote:—"I am directed to inform you that the packet in question was prepaid at the sample post rate, and was therefore subject to examination in this office for the purpose of ascertaining whether the contents were admissible into this country at the sample rate of postage. It was then observed that the spectacles were broken, and the packet was forwarded to you. Had they been intact the parcel would have been regarded as containing an article of saleable value (which is contrary to the sample post regulations), and would have been returned to the country of origin In these circumstances, no claim can be entertained." The added comments on Government procedure, etc., are of little general interest. But it would be interesting to know under what circumstances the "man at Peterborough" ordered his pair of spectacles "from the continent."

Recent Optical Patents.

Complete Specifications Published.

1920.

138773. Clark, Photography.
141312. Sutherland, Apparatus for producing kinematograph pictures.
146147. Honig, Device for optically determining the position of aircraft.
146432. Optische Anstalt Goerz Akt-Ges., Periscopes.
146464. Zeiss, Kinematograph apparatus.
148737. Gleichmar, Three-coloured photography.
167248. Gallwey, Measuring-gauges.
166842. Hilger, Ltd., Williams and Smith, Polarisers of polarimeters, saccharometers, and such like instruments.
166868. Henderson, Gyroscopic compasses.
167012. Geyer and Tripp, Automatic safety control for kinematograph machines.
167018. Wright, Radiogoniometers especially suitable for use in wireless direction finding.
167024. Kaufman, Colour indicating charts.
167037. Jackson, Drawing compasses.
167095. Wingate, Ophthalmoscopes.
167099. Straut and Hochstrasser, Sliding rules.
167370. Siewerssen, Kinematograph cameras.
167382. McDonnell, Pocket sterilising cases for clinical thermometers.
167691. Heath & Co., Ltd., Means of packing and securing sextants and like instruments in their cases.

1921.

157160. Hartford-Fairmount Co., Method of and apparatus for feeding molten glass.
159192. Optische Anstalt Goerz Akt-Ges., Stereoscopic methods and apparatus.

Floating Exhibition Scheme.

A Floating Exhibition of British manufactures is to be launched from the Thames in the summer of 1923. According to present plans, a specially designed Exhibition Ship will be constructed by Messrs. Swan Hunter & Wigham Richardson, Ltd., and will proceed to ports on the West Coast of South America, thence to South Africa, Australia, New Zealand, Yokohama, Shanghai, Hong-Kong,

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Manila, Singapore, Penang and Rangoon. The Indian ports to be visited include Calcutta, Madras, Colombo, and Bombay. The voyage will be of eighteen months' duration, covering a distance of 43,000 miles; and 31 important trade centres will be visited for periods of a week or more, giving a total of 316 days during which the exhibition will be open. It may be remembered that a similar scheme was projected some 15 years ago, but failing to win adequate support, it was abandoned. We hope that the new project will deserve and obtain a brilliant success.

Optics in Venezuela.

Importations of eyeglasses, opera and field glasses, automobile goggles, microscopes, and unmounted lenses into Venezuela are practically confined to dealers in Caracas. The market for optical goods of all kinds is restricted (says the U.S. Consul at La Guaira) spectacles and eyeglasses being the articles for which there is most demand. As the number of Venezuelans engaged in occupations that strain the eyes is comparatively small, the majority leading an open-air life, the demand for eyeglasses is less than it would be with a population of 3,000,000 in other, more industrially developed countries. The statistics available on importations are confined to eyeglasses and lenses and to opera glasses and field glasses. The following tables show the importations for the last three available years:

Eyeglasses and Lenses.

Year 1916	...	Pounds 847	Value	$1,570
,, 1917	...	,, 933	,,	31,171

Opera Glasses and Field Glasses.

Year 1916	...	Pounds 31	Value	$52
,, 1918	...	,, 428	,,	1,685

For the first half of 1916 and prior thereto statistics are not available for importations by parcel post, which is the method of importation for by far the greater part of these goods.

The styles of eyeglasses used are the same as in the United States, importations since 1914 coming almost exclusively from that country. Before the war glasses and solid-gold frames were largely imported from Germany, as prices there were much cheaper for goods of equal quality; but American goods have now become very popular and unless offers are made elsewhere of better goods or more favourable prices than American dealers will make, the prospect is that the bulk of these goods will continue to come from the United States. American lenses are said to have attained an excellent quality. The closer proximity of the United States will be an important determining factor in this trade.

Nothing in this line is manufactured in Venezuela except that recently an optical dealer in Caracas has installed machinery to grind lenses, the material for which has to be imported.

Optical goods in practically all cases are imported by the wholesale dealer in Caracas, who furnishes supplies to the few small dealers in other parts of the country while at the same time doing a retail business. The trade is not sufficiently large to support an exclusively wholesale house. Jewellers at times sell opera glasses, but the trade in these is negligible. Importations by firms doing a strictly retail business are rare.

New Company.

British Association for the Advancement of Radiology and Physiotherapy. (The word "Limited" being omitted from title by licence of the Board of Trade). Registered as a company limited by guarantee. The objects are: to promote the advancement of radiology and physiotherapy on scientific lines under the direct control of the medical profession. The management is vested in a Council, the first members of which are:—R. Knox, 38, Harley Street, W., F. Hernaman-Johnson, 66, Harley Street, W., O. MacGregor, 14, Welbeck Street, S. G. Scott, 6, Bentinck Street, W., Sir Archibald D. Reid, 30, Welbeck Street, W., S. Melville, 9, Chandos Street, W., and Agnes Savill, 7, Devonshire Place, W. Solicitors: Bristowe, Cooke and Carpmael, 1, Copthall Buildings, E.C.

An improved method of welding optical glass worked out at the U.S. Bureau of Standards gives perfect union with practically no distortion, and is adapted for many purposes, such as making glass cells and hollow prisms, joining lenses, and closing glass tubes with accurately fitting flat ends. The shaped glass object is heated in an electric furnace to the annealing point, when the application of a small blowpipe flame along the edges to be united produces a quick welding.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Rx

LYONS' SERVICE

Our Aims are
Quality & Promptness
For High Class Rx Work.

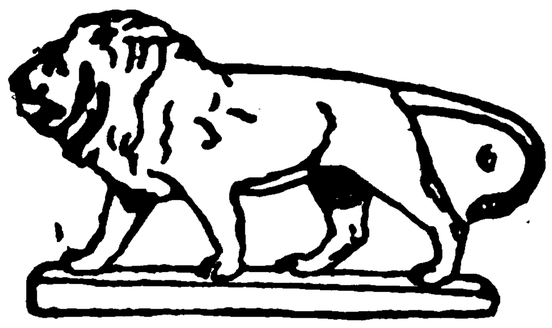
——TRY US.——

Stock Orders solicited

FULL STOCKS:—Gold and G. F. Cable Frames and Astigs, Rimless Mounts, Shell Goods, Cases, Cords, Chains and UNCUT LENSES.

F. H. C. Lyon,
Wholesale & Manufacturing Optician,
59-61, Hatton Garden, London, E.C.1

Telegraphic Address:
CYLTORREXO, SMITH, LONDON.



Regd. Trade Mark.

Telephone No.:
HOLBORN 1203.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Rx

SANDRO LOWY

Optical Rx Specialist,

88, Goswell Road,

LONDON, E.C. 1

Telephone: CITY 984 (two lines)

Telegrams: SANOPTIC, LONDON.

Rx

C. SWAIN, Ltd.,

51, Strand, London.

A B C Code 5th Ed.

'Phone:—GERRARD 5179. Factory: FOREST GATE.

UNCUT
Sphs
Sph Cyls
Plano Cyls

A.O.C. EDGED
Peris & Bi
Cx & Co etc.,

at Best Prices.

Canadian Goggles.

American Styles, made in Canada to supply demand for British goods. A full line of colored lensed goggles in metal and zylo frames, with and without leather, metal and collapsible dust shields for motor, motorcycle, all out-doors, all industrial uses.

Send for Catalogs or Samples.

CANADIAN GOGGLE Co.,

Manufacturers,

57-59 King William St., HAMILTON, ONT.

Sir William Crookes' Ultimate Glass was, as the name implies, his very last effort—the ultimate result of his many years work. Crookes A and B were Sir William's early attempts, with which however he was by no means satisfied. Crookes A and B are certainly Crookes; but the latest form of Crookes Glass is that which is under the absolute control of Sir Wm. Crookes Anti-Glare Glass Co., Ltd.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

FOUND

AT 36, GRAY'S INN ROAD, LONDON, W.C. 1, A HOUSE THAT CAN GIVE YOU AN

EXCELLENT **RX** SERVICE

Combined with

SPEED, ACCURACY & INDIVIDUAL ATTENTION.

If you are looking for a house of this description, send a few trial orders and be

REWARDED

KIRK BROTHERS

WHOLESALE & MANUFACTURING OPTICIANS

36, GRAY'S INN ROAD, LONDON, W.C.1

Telephone: HOLBORN 1620 (Private Exchange). Telegrams: KIRBROREX, HOLB. LONDON.

Price List and Prescription Book on Application.

F. PARKER WOOD,

Wholesale Manufacturing Optician,

47, MARK LANE, E.C.3

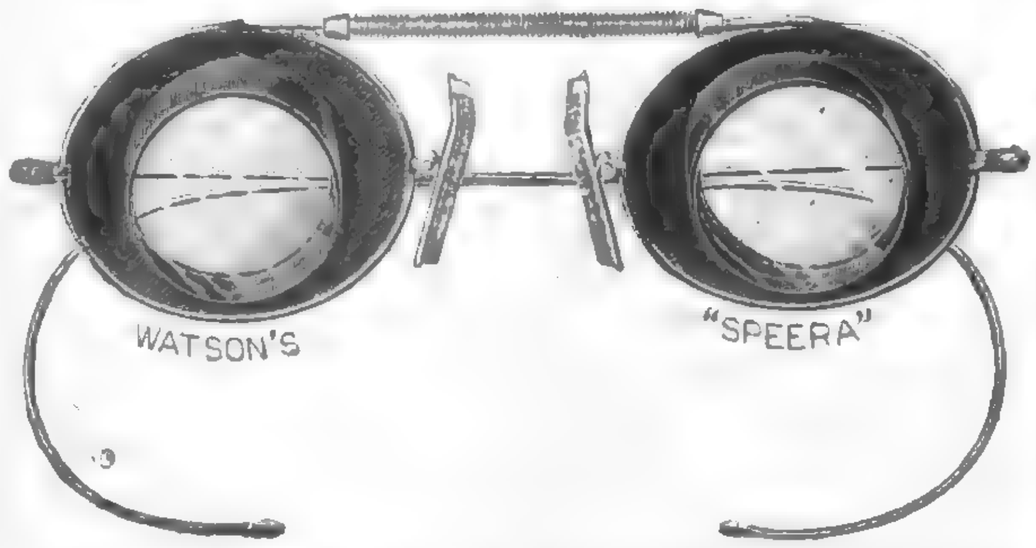
Immediate delivery from stock:

TELESCOPES
FIELD GLASSES
PRISM GLASSES
MICROSCOPES
ANEROIDS & CLOCKS
BAROGRAPHS
SEXTANTS
BINNACLES
COMPASSES
CHRONOMETERS, New & Second-hand

Repairs a Speciality.
Clinicals and all other Thermometers.

PARALLEL GLASSES of every description.

WATSON'S "SPEERA" BINOCULAR MAGNIFIERS.



A pair of ACHROMATIC lenses are mounted in a spectacle frame, which may have either an adjustable spring bridge, or an ordinary saddle. For the best effect to be obtained, the eye-centres must be accurately specified, and if saddle bridge is used, it must be made of the proper height and shape. The necessity for these precautions will be appreciated when it is known that the lenses have to be set in the frame at a slight angle, so that they both converge precisely on the focal point. The variety of uses to which this Magnifier can be put will ensure a large sale.

It is proposed that names shall be kept of opticians willing to supply them, and applicants will be referred to their local opticians for measurements.

Watson's will be pleased to hear from opticians, who would interest themselves.

Full particulars from:—

W. WATSON & SONS, Ltd.,
313, High Holborn, London, W.C. 1
Works—Bells Hill, High Barnet. Established 1837

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

OPHTHALMIC AND SCIENTIFIC
MOULDINGS
Supplied in any Curvature and Glass.
CROOKES A SPECIALITY.
REYNOLDS & BAILEY, 15-19, VINE ST.,
LONDON, E.C.1

DIXON & HEMPENSTALL,
Wholesale and Manufacturing Opticians,
12, SUFFOLK STREET, DUBLIN.
Telegrams "Optics, Dublin."

FINEST
ROUGH CYLINDER BLANKS,
Also good 2nd Selection
A very attractive proposition for Export and cheaper work.
CHANCE'S GLASS USED.
ACTUAL MANUFACTURERS
ASSOCIATED OPTICAL WORKS, Ld
5, Queen's Buildings, London, W.1
Near Tottenham Court Road.
No Connection with any other Firm. Telephone: Museum 2216.

Worshipful Company of Spectaclemakers.
Tuition for the Company's Examinations in Optics and Sight Testing at
THE SCHOOL OF OPTICS Ltd.
2, GUILFORD PLACE, LONDON, W.C. 1
Particulars on application.

TO LENS MANUFACTURERS
For Disposal (In Perfect Condition)
1 12 Spindle Machine for Bi & Cy/L Lenses
1 20 „ „ „ Meniscus „
1 10 „ „ „ Deep Bi, Peris & Meniscus Lenses
Together with Blocks. Also a large quantity of White Blanks (Ovals and Rounds). And Dropped Blanks.
Full particulars on application to Box 3454, c/o "The Optician," 125, Fleet Street, E.C.4

FOR DISPOSAL
About 2,000 perfect lenses, Spheres and Sph. Cyls edged and rimless.
Assorted eyes in bags labelled with focus.
What Offers?
H. C. HOUGHTON, B.O.A., St. Michael's Row, Chester.

C. BAKER HIGH HOLBORN LONDON
Estab. 1765
Do You Handle Kodaks?
The "Metron" Plate Adapters, if stocked, will mean a large Increase of Business.
PARTICULARS AND TERMS ON APPLICATION

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
C. C. DYMOND. M.I.Mech.E., F.I.C.P.A
W. P. THOMPSON & CO.,
12, CHURCH STREET, LIVERPOOL.
Chartered Patent Agents.
H. E. POTTS. M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and AERONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
ESTABLISHED 1878 TELEPHONE CITY 419

PERCY S. DE SAULLES.
Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES
Micro Cover Glasses, Glass Cells and Cavity Slips, etc.
The Platts, Amblecote, Stourbridge.



OPTICAL BLOCKS
To illustrate all features of Optical Service. Write for lists.
CHEMISTS' DESIGN SERVICE
12 Humberstone Gate, LEICESTER.

SPECTACLES & EYEGLASSES.
Their Forms, Mounting and Proper Adjustment
by R. J. PHILLIPS, M.D.
Fourth edition revised with 58 illustrations.
Price 6s. 6d. Post Free 7s.
THE HATTON PRESS, Ltd., 125, Fleet Street, London, E.C.4

INDEX TO "THE OPTICIAN."
Volumes 45 to 57.
Price 6d. each. Post free from
"The Optician," 125, Fleet Street, London, E.C. 4

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Shur-on Glasses

Prestige

—with a reason

The optical specialist who sells and recommends Shur-on eyeglasses, spectacles, mountings and cases realizes that they, like diamonds, have inferior imitations.

And by featuring Shur-on products, he further shows his appreciation for the good-will and continued patronage of his clients.

Ever since 1864 the name Shur-on on an optical product has meant "Quality Beyond Question." Ask your wholesaler to show you the Shur-on line.

Shur-on Optical Co.,

Rochester, N.Y., U.S.A.

Quality Beyond Question Since 1864

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

FOR SALE. Trial case, trial frame, Orthops chart, lens drill with motor, lens cutter, automatic rimless edger (unused). Box 3472, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

FLAT Travelling Trial Case, 50 prs. sphs., 36 prs. cyls,. prisms, etc. Offers to Box 3470, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED luminous retinoscope. Box 3471, c/o "The Optician," 125, Fleet Street, E.C.4.

£20. Optician's stock comprising quantity R.G. finger-piece mounts, gold and R.G. frames, quantity rimless and other lenses, ear chains, material, etc., £20 the lot. Full particulars, apply to Box 3465, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1. Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

WANTED to purchase. A good well-established sight-testing optical business, South Coast or W.E. London, preferred, takings about £2,000 p.a. State full particulars to Box 3468, c/o "The Optician," 125, Fleet Street, E.C.4.

SIGHT-TESTING and Watch repairing business. Busy main road. Takings, £700, price £375, lease. S.A.V., £100. Apply, 13, High Street, Acton.

Employment Bureau. *Concluded from page 8*

QUALIFIED optician with expert knowledge of general optical instruments and microscopes desires post as manager. Box 5655, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED assistant wishes appointment. Midlands preferred. Box 5057, c/o "The Optician," 125, Fleet Street, E.C.4.

The Optical Society.

President: Mr. R. S. WHIPPLE, M.I.E.E.
Vice-Presidents: Prof. FREDERIC J. CHESHIRE, C.B.E., Director of the Technical Optics Department of the Imperial College of Science and Technology, South Kensington; Sir HERBERT JACKSON, K.B.E., F.R.S.
Hon. Treasurer: Mr. I. G. AITCHISON, B.A., LL.D.
Hon. Secs.: Mr. L. C. MARTIN, B. Sc., Imperial College of Science and Technology, South Kensington S.W.7 and
Papers' Secretary: Mr. F. F. BRYSON, M.A., B.Sc.

The Society of Chemist-Opticians.

President: Mr. F. S. HORSBY
Vice-Presidents Mr. FOURACRE.
Hon. Secretary: Mr. J. HARCOMBE CUFF, Friern Barnet Rd. New Southgate, N. 11 Telephone Finchley
THE SUPPORT OF ALL CHEMIST-OPTICIANS IS EARNESTLY INVITED.

Midland Optical Society.

President Dr. G. A. SHAKESPEAR, D.Sc., M.A., Acting Professor of Physics, Birmingham University.
Vice-Presidents: W. E. CHARNLEY, Leicester; W. T. COMER, Walsall; H. L. TAYLOR, Birmingham.
Hon. Treasurer: JAMES LUCKING, Birmingham.
Hon. Secretary: JOHN C. ROLSTON, 36, Trafalgar Road, Cape Hill, Smethwick, Birmingham.
Anyone interested in the science of optics and residing Midland is heartily invited to join.

THE MARK OF
QUALITY AND RELIABILITY

ELLIOTT'S
Revised
Rx Price List
on application to
Elliott Optical Co.,
104 & 105 GT. SAFFRON HILL,
LONDON, E.C.1

Elliott's Rx Service is What You are Looking for.

BLUE GOLD
Well hardly that, but we can do White or Yellow.
Write for samples and Prices. Rimmed and Rimless. Style and finish guaranteed.
IT WILL PAY YOU.
HAMPTON OPTICAL CO., Ltd.,
28, ESSEX STREET, BIRMINGHAM.

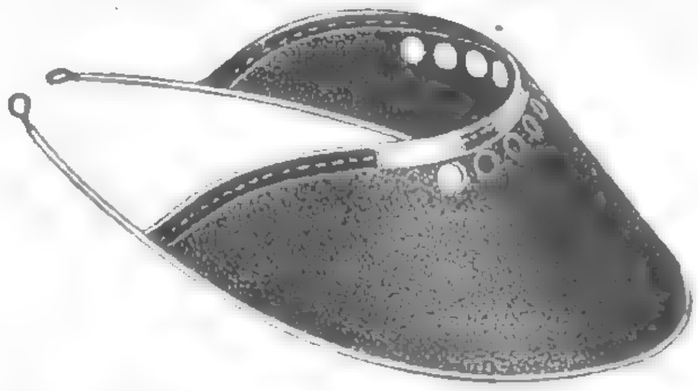
Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.
STERLING ACCEPTED AT PAR.
COMMERCIAL OPTICAL Co.,
DANDURAND BLDG., MONTREAL.
Cable "Optical" A.B.C. Code 5th. Edition.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

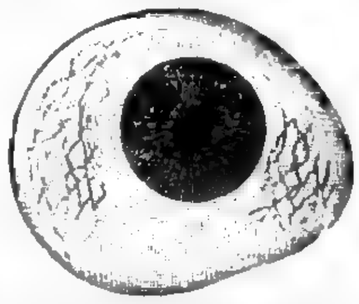


Automatic Eyeglass Chains.

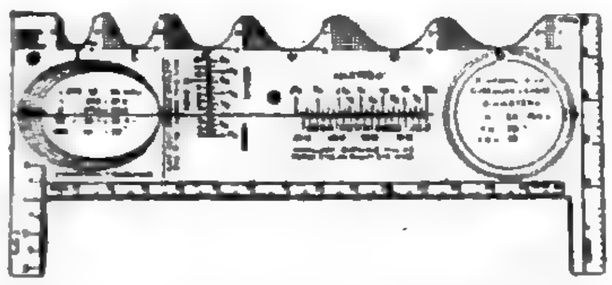




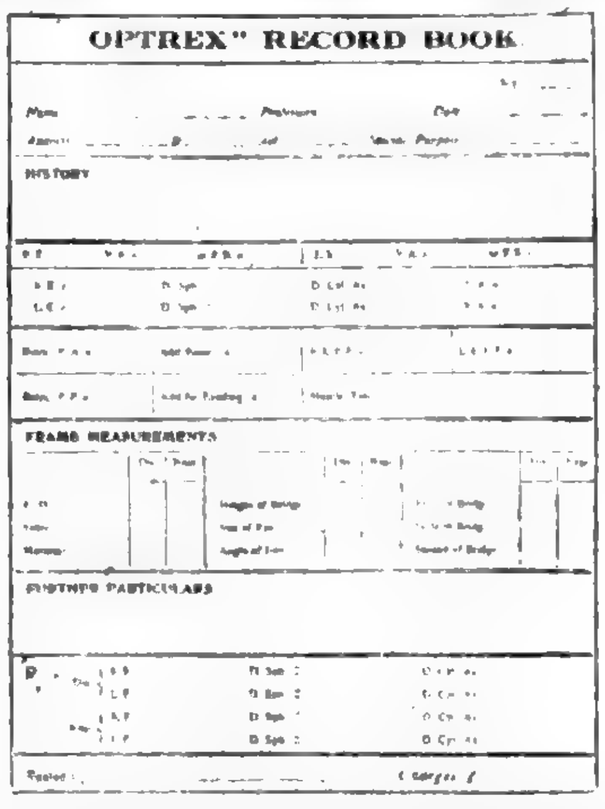
Eye Shades and Reading Shades In Great Variety.



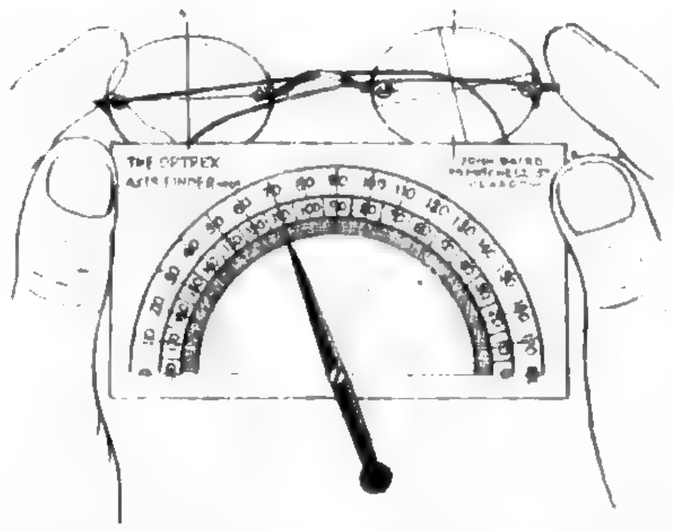
Artificial Eyes, Snellin or Shell at moderate prices. Samples and quotations on application.



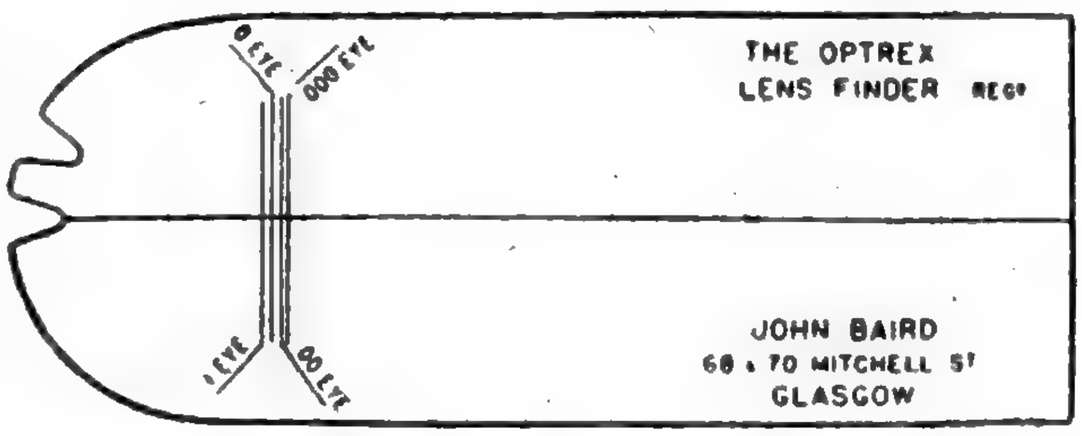
The 'Optex' Rule for Facial and Frame Measurements. The only Rule combining all necessary measurements for either ordering or checking Rx work. Made in Aseptic Ivorine only. Handy size for pocket 7½ x 3½ in. 10/6 in case or 9/6 without. Complete with instructions (illustrated)



The "Optrex" Record Book. No. 101 containing 500 Record Forms with full details for each test, quarter bound with index and title page, 7s. each. No. 102 ditto, but contains 250 forms, 5s. each. Postage extra.

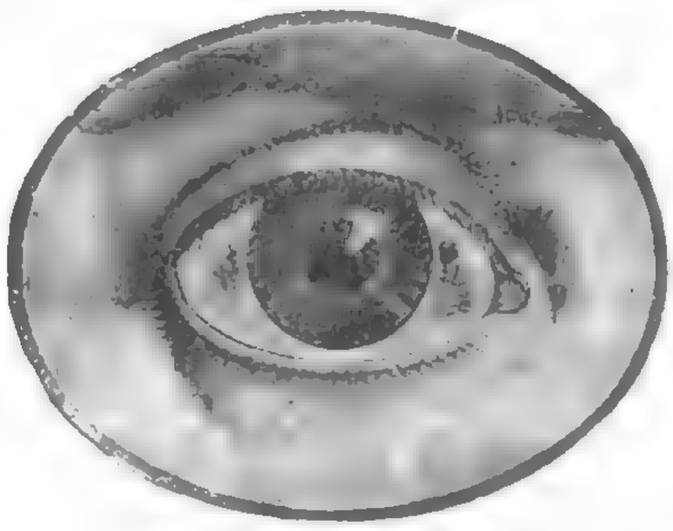


The "Optrex" Axis Locator for quickly finding the axis of plano cyl. or sph. cyl. lenses. Price 5/6 each. Post Free.



(Exact size. Made in Transparent Celluloid.)

The "Optrex" Lens Finder for Rimless Eyeglass Mounts. It enables the optician to stock and fit the actual mount which is to be glazed for his client, giving the correct size lens for the P.D. Price 1/3 each. By post 1/5 each.

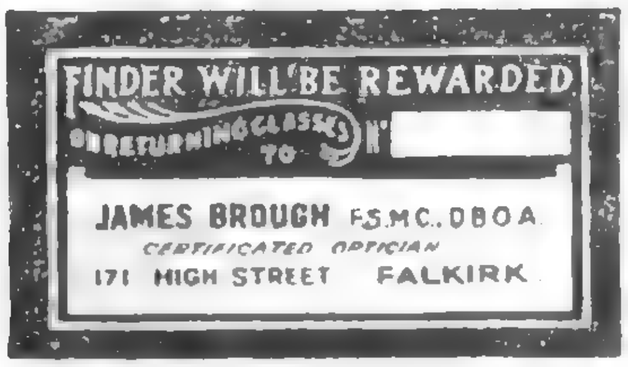


Translucent Eyes for Windows and Show Cases, in 3 sizes.

6 x 4½ ins.	...	...	1/9
12 x 9½ ins.	...	...	3/-
18 x 13½ ins.	...	...	9/-

per pair. Postage 3d. extra.





The "Optrex" Case Labels. Round or Oblong, printed complete with any name and address 8/3 per 1,000

R (Standard Notation) **L**

		SPH.	CYL.	AXIS	SPH.	CYL.	AXIS
DST							
RDG							

The "Optrex" Rubber Rx. Stamp.

3/9 each. By Post 3/11.

Very useful for rough records and post card orders.

JOHN BAIRD, "HERALD" OPTICAL WORKS,

Manufacturing Optician, 68 & 70, MITCHELL ST., GLASGOW.

Telegrams: "SPECTACLES, GLASGOW." *Telephone: CENTRAL 541.*

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

A.—**Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

REPRESENTATIVES.

I have several vacancies for Travellers both for the Provinces and London.

Previous experience of travelling for a wholesale Optical House essential.

Apply by letter to

MR. F. H. C. LYON, Wholesale & Rx. Optician, 59/61, Hatton Garden, E.C.1.

ASSISTANT, age 18, seeks situation. Edging, rimless fitting and all Rx work. Attend customers, etc., Apply, J.G., 52, Battersea Park Road, S.W.11.

WANTED position as traveller. Two years' experience of trade. Ex references from present employers. Box 5650, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, 21, desires situation with good class optician. Capable refractionist and salesman. Repairs. Knowledge of photography. Permanency desired. Good references. Box 5649, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Man partly qualified, knowledge of sight-testing, desires position with sight-testing optician. Apply, "A.W.," 15, Berkeley Road, Tunbridge Wells.

YOUNG Man, 22, requires position with ophthalmic optician, South Wales, or West of England preferred. 1 year's experience as an assistant, willing to start with small salary. Box 5653, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Lady for optical workshop, experienced in neutralising, bevel and rimless edging and fitting. State experience and salary required to Box 5652, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED traveller. London, Provinces and Abroad **desires engagement to manufacturing opticians, including surveying instruments and drawing office materials. Fluent French. Highest credentials. Box 5640 c/o "The Optician," 125, Fleet Street, E.C.4.**

COMPETENT surfacer seeks situation thoroughly experienced. Torics, cyls., sphere. Apply, W.M., 32, Vernon Gardens, Seven Kings, Ilford.

SCIENTIFIC Instrument Maker, Turner, etc., requires position, 20 years' experience, optical, electrical, surveying, and drawing instruments, any capacity. London preferred. Apply, Box 5642, c/o "The Optician," 125, Fleet Street, E.C.4.

GENTLEMAN with sound connection with retail and wholesale opticians in the East and Far East, shortly proceeding on tour, will be pleased to hear from manufacturers wishing to place their line of goods in the Eastern market. Box 5654, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Gentleman, 24, studying for B.O.A. examination, **desires post where practical experience may be gained, low salary. Box 5644, c/o "The Optician," 125, Fleet Street, E.C.4.**

POSITION required by assistant. Capable and careful tester, good knowledge of sight-testing optics and routine, 5 years' experience. All general repairs. Disengaged. London preferred. Studying November's S.M.C. Apply, "J.," 4, Upper Tulse Hill, Brixton, S.W.

SIGHT-TESTING Optician, thoroughly competent and reliable, good retinoscopist and salesman. Age 40. Tall, pleasant manner, seeks engagement. Box 5645, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. D.B.O.A., seeks London engagement, 6 years' workshop and consulting room experience. Accustomed to checking and general supervision. Apply, "Toric," 59, Eden Street, Kingston-on-Thames.

REFRACTIONIST, 33, tall, smart appearance, with long sight-testing and practical experience (London and Provincial) requires situation as branch manager or assistant, excellent references. West of England or South Wales preferred. "Trolos," 22, Toronto Road, Horfield, Bristol.

FIRST-CLASS Rimless fitter seeks situation, edging and bifocal worker. Age 21. Wholesale and retail experience. London or suburbs preferred. Box 5647, c/o "The Optician," 125, Fleet Street, E.C.4.

GLAZIER (Male), requires job or would be useful at shell work, etc. Apply, P., 20, Compton Buildings, Goswell Road, E.C.1.

FIRST ASSISTANT (24), 9 years' experience wholesale and retail, requires situation with good class firm. Smart salesman, reliable tester, and conscientious worker. Used to taking full charge. Wide experience in oculists' prescriptions. Would consider good wholesale position London or suburbs preferred. Excellent references. Disengaged Sept. 30th, 21. Box 5648, c/o "The Optician," 125, Fleet Street, E.C.4.

TOOLMAKER seeks situation. Press tools, capstan and general work. 22. Experience, 14 years in optical works. Apply, W. T., 766, Holloway Road, N.19.

EXPERIENCED all-round glazier seeks situation rimless edging, drilling, fitting and cementing. Write, W.B.C., 114, Kilburn Park Road, Kilburn.

MANAGER. 3 years' experience in sight-testing with thorough knowledge of workshop routine desires change Eastern or South Eastern counties preferred. Permanent. Good reference. Box 5630, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN, 21, desires situation as assistant to retail Optician experienced in sight-testing, etc.. Box 5631, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. desires position, City or West End, extensive wholesale and retail experience. Write, Box 5639, c/o "The Optician," 125, Fleet Street, E.C.4.

GENTLEMAN, thoroughly experienced manufacture optical and scientific instruments. Machine shop work, assembling and adjusting, requires position, could assist management. Box 5636, c/o "The Optician," 125, Fleet Street, E.C.4.

SIGHT-TESTING assistant, 24, offers services to good class firm or employer. Nearly two years' excellent experience. Sound frame fitting and repairs. Trustworthy. State approximate salary. Apply, Raymond Worgan, Rumney, Cardiff.

WANTED, female rimless drillers and fitters, first class work, permanent. Apply, Box 5547, c/o "The Optician," 125, Fleet Street, E.C.4.

LADY Optician requires post. 5½ years' experience sight-testing. Retinoscopy, etc. Can take full charge. Box 5646, c/o "The Optician," 125, Fleet Street, E.C.4.

REQUIRED for India, thoroughly competent optician, qualified preferred. Apply, Lawrence & Mayo, Ltd., 19, New Oxford Street, W.1.

JUNIOR (D.B.O.A.) seeks position in good house (Liverpool or district preferred). Good refractionist, all repairs, mounting and soldering. Smart address. 5 years' experience. Disengaged early October. Box 5651, c/o "The Optician," 125, Fleet Street, E.C.4.

ADVERTISER, 36, requires permanency, 12 years' experience Optical Instrument trade, spectroscopic and experimental work, chemistry, etc. Moderate salary for good opportunity. Box 5656, c/o "The Optician," 125, Fleet Street, E.C.4.

Concluded on page 6.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE

MYDDELTON



TORTOISESHELL SPECTACLES.

In Selected Solid Tortoiseshell.

Dark, Light-Mottled, & Amber, with 9ct. gold joints only.

The vogue of tortoiseshell spectacles is due to the re-discovery of their elegance and comfort; **MYDDELTONS** are a further re-discovery of an old form. They are made is a particular style which ensures an easy "cling", keeps them comfortably in position and enables them to be assumed and removed with the utmost ease, and they are supplied in a compact snap case, size of illustration. **MYDDELTONS** have been thoroughly tested and have "made good," and increased output now enables us to invite a larger number of opticians to avail themselves of an article of real distinction.

SOLE MANUFACTURERS:—

R. ARCHER & SONS, Ltd.,

1, AMWELL STREET, LONDON, E.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE OPTICIAN
Reg. at G.P.O. as a Newspaper

AMERICAN OPTICAL COMPANY, LIMITED



WINDSOR

PATENTED

The most becoming spectacle for young people.

School children must have glasses that are durable and becoming —durable because of the constant carelessness with which they are handled; becoming because of children's extreme sensitiveness to ridicule. Wellsworth Windsors meet both these requirements. Keep your Juvenile patients smiling by fitting them with Windsors.

The Wellsworth Windsor construction is protected by British Letters Patent. Beware of infringements.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C.4. (Printed by The Century Press, Fulham.) Sep. 9, 1921.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT-MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1590 FRIDAY, SEPT. 16, 1921.

ROSS LENSES
AND
BINOCULARS.

There are no finer instruments obtainable than Ross Lense and Ross Stereo Prism Binoculars. The name of Ross is a guarantee of their quality.

A generous supply of advertising literature and showcards is supplied to all Ross dealers.

Send for our new catalogues and terms.

ROSS Ltd., Clapham Common, LONDON, S.W. 4

ELLIOTT'S
Rx Price List
shows
Substantial Reductions.

High standard of work fully maintained—
Perfectly satisfactory service in all ways
Write for New List and Complete Set
Stationery which will be sent free of charge.

104/5,
GT. SAFFRON HILL,
E.C. 1



ARCHER
LORGNETTES
IN GOLD AND TORTOISESHELL
WITH THE AMWELL STREET FINISH

R. ARCHER & SONS, Ltd.,
1, Amwell Street, London, E.C.1

Reg'd at the G.P.O. as a newspaper PRICE 4d Subscription post free 12 months 17s
Postage in United Kingdom 1d

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

AMERICAN·OPTICAL·COMPANY, LIMITED.

WELLSWORTH POLISHED ALUMINIUM CASES.



The Wellsworth 24C Aluminium Case Cabinet is a most attractive and effective silent salesman. Keep it in a conspicuous place on your counter. It will sell cases for you.

The assortment contained in this cabinet consists of:

1—706 Fingerpiece size
4—708 Regular Eyeglass size.
13—328 Riding Bow Spectacle size.
3—378 Large Riding Bow Spectacle size.
3—716 Large Fingerpiece size.

WELLSWORTH

TRADE (A) MARK (Regd.

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

GEORGE CULVER LTD

Manufacturing Opticians,

JOBBING AND PRESCRIPTION WORK

ACCURACY,

NEATNESS,

PROMPTNESS

Large and full stocks of English made Lenses of all combinations. Orders can be executed promptly.

OPTICAL WORKS:
WHITE LION STREET,
PENTONVILLE,
LONDON, N. 1

TELEPHONE:
NORTH 369 and 871

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

J&R FLTD

THE LLOYD AXOMETER.

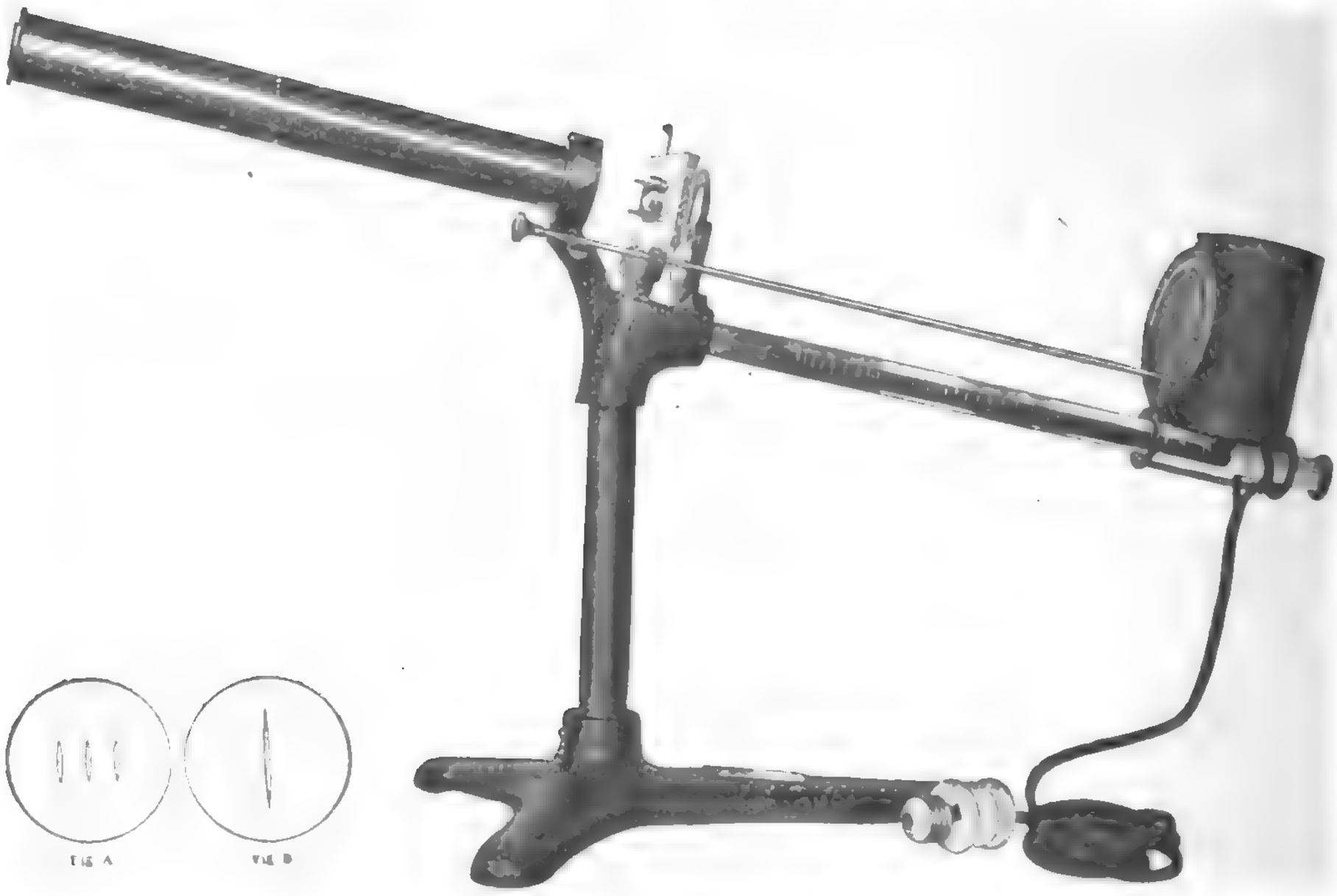


FIG. A FIG. B

A precision instrument for the measurement of lenses mechanically, simply and quickly.

The latest model can be demonstrated in our showrooms.

Particulars on Application.

J. & R. FLEMING LTD.,

Telephone :
HOLBORN { 814 / 815
HOLBORN { 2788 / 2789 } Prescription Dept.

136-148 Clerkenwell Road,
LONDON, E.C. 1

Telegrams :
"OTTICO." LONDON.

Branches with Prescription equipment :

WALTER BRAHAM & Co. Ltd.
6, Key Hill Drive,
BIRMINGHAM.
Phone: Central 2509
Telegrams: "Brahma."

37, WESTGATE STREET,
CARDIFF.
Phone: Cardiff 44
Telegrams: "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1085.
Telegrams: "Ottico."

8, SHUDEHILL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

J&R FLTD

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
Col. & Ald. Sir CHARLES C. WAKEFIELD, Bt., C.B.E.

Upper Warden
The Rt. Hon. VISCOUNT HILL.

Renter Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Director of Examinations
The Rt. Hon. Sir WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS

of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., on Oct. 31st, 1921, and during the first week in November.

Last date for Entries, Sept. 30th.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,589

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices
123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, SEP. 16, 1921.

Some Retail Profits.—It is rather fortunate that the optician's business is not one of those that come under the ban of writers in the Press who are beginning to wake up to the fact that unnecessary profits, levied on the distribution of basic necessaries of life, are nourishing the roots of our industrial unrest, and are responsible for inflated wages and hence, owing to excessive costs of manufacture, for such failure as is to be observed in the British export trade. The grievance alleged by these critics seems to us, as to many others, a very real one. But it relates to the services of what we will term the unskilled middleman. When the element of technically skilled service is introduced in the distribution of goods, as with the trade of ophthalmic opticians, chemists, dentists and various others, profits are earned, or should be, which are commensurate with the time, expense and intelligence required to fit a man for the competent performance of highly specialised duties. When trained manipulation and scientific advice has to be paid for, the rule holds good that cheap service is relatively dear service at its price. Indeed, we are firmly convinced that the present scale of charges made (on an average) by

Digitized by Google Original from THE OHIO STATE UNIVERSITY

retail sight-testing opticians is by no means adequate to pay for the time and care which ought to be given in adapting lenses and in fitting. The members of the optical profession ought to assert this fact with more confidence, speaking with honest conviction; and the public should be made to realise the merits of the case.

* * *

With complaints by the public as to excessive difference between manufacturers' or wholesalers' prices and retailers' prices, on articles of every-day purchase, we are all bound to associate ourselves. We all feel the pinch, and even if inclined to be careless in the matter of our personal household budget, we must deprecate the gross profiteering which is rampant among tradesmen who just "fetch and carry" for those every-day purchases which even the poorest must make. This is no question of philanthropy, evoked by the troubles of a "submerged tenth" of our population; and it has no sort of relation to class sympathy. The inescapable fact is that all wages relate themselves to what is termed the "basic" wage, or what some labour agitators prefer to style the "fodder" basis. To recall a phrase of Napoleon's, our labour army "marches on its stomach." And all differences (great as they are) between the average wage rates in various countries are bound up very intimately indeed with the differing price of distribution of, in Biblical phrase, "the fruits of the earth." The price of any sort of manufactured goods—in the home market—has not nearly the same importance as the price of food. Disregarding for a moment local wage rates, and assuming that all trade in foodstuffs is as it should be, free, there must be ascertainable a "world price" for those things proper to the sustenance of a labouring man—to which price is necessarily added only the expenses of distribution.

* * *

Wages and Waste.—If it be thought derogatory to the tone of a scientific newspaper to refer to such matters as the price of potatoes, corn or sugar, it is certainly not so to the mission of any commercial newspaper. For the grossly inflated rates in the labour market of this country, like the absurd demands for money by great numbers of unemployed, definitely result from the profits which are levied on distribution of such things. And if we pass by the too notorious scandals of centralised Government expenditure, it is these wages rates and these charges on behalf of our unemployed, that so gravely tax the profits of professional men like retail opticians, and of the manufacturing and wholesale optical firms. Still worse, they constitute a most serious menace to the prospects of British export business. In the case of ophthalmic goods and other optical or scientific apparatus, as indeed with all classes of manufactured articles, the world's demand is much greater than the present supply; but there is too little demand in foreign markets for our British goods—at British prices. These prices have got to be lowered if our export trade, so vital to the existence of this country, is to be developed. Not by lessening the rewards of skilled supervision, and not by reducing manufacturers' profits below the amount which is attainable under a system of fair competition, but by reducing taxation and rating, and the "cost of living."

* * *

If the proper and obvious steps had been taken in this direction, it would (for instance) have been the law of the land as has been often urged, that no outdoor relief, except for rent, should be afforded otherwise than in kind from purchases at current wholesale figures; instead of pampering and at the same time demoralising the distressed section of our countrymen by handing out treasury notes to find their way into the swollen accounts of butcher, greengrocer, publican and so on. This sort of purchasing at wholesale by local authorities to abate genuine distress, is the one and only direction in which, perhaps, most of us would approve any Government interference with trade. The hand of Government whether centralised or local Government, is a blighting influence when laid on any part of the mechanism of our internal trade. An illustration which is apt from the standpoint of our readers, is afforded by the doctor's trade (in the larger sense, of course, the exercise of every profession is a trade, adding to national efficiency and therefore national wealth). Here Government has undertaken to "father" the insured class of workers, and with some deplorable results. Insured wage earners of the better class prefer not to "line up" to their panel doctors if they can afford to pay for medical attention elsewhere. On the other hand, the panel doctor is often greedy to enlarge his clientele beyond reasonable limits. Perfunctory treatment is the necessary consequence; and cases of tuberculosis and other serious disease escape early proper examination and diagnosis. Any large employer of labour who is in sympathetic touch with his factory hands can learn the truth about this farce of the Insurance Act.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

National Insurances.—The fact is that something can be said for Government insurance schemes,, on the ground that some industrial concerns ruthlessly exploit their clients; but when Government steps outside the province of finance into that of administration, and (as in this particular case) "prescribes" the prescriber, many unfortunate consequences ensue. Ophthalmic opticians, it may be remarked, are threatened with a baneful offshoot of the Insurance Act, to be fastened on them by the "National Insurance Beneficent Society." Being legally unorganised (unlike the medical men) they are not in a position to "exploit" the public even if inclined to do so, but are in more danger of being exploited themselves. It is perhaps a pity that all sight-testing opticians, without distinction of "competency," were not registered under a Sight-Testing Act, as might have been possible nearly twenty years ago; for if that had happened the industry would have been more limited in number and more effective as a political unit than it is to-day. However, to return to the wages question: "Cost of living," in which Government interference is mischievous, must be brought down by the action of the people themselves. Thus wages must re-adjust themselves to a rate which will at least reasonably compare with the wages paid in Germany. For it is wrong to suppose that the German workman is stinted of desirable food and drink, or the other little amenities of working class life. Too much attention is sometimes paid to figures which depend on the rate of exchange, overlooking the fact that apart from mere money prices, the actual cost of living to German workmen is lower, and the basic wage rate much lower, than here. Here every professional man, merchant and manufacturer is oppressed by direct taxes proving impossible to be born. Here the demands of many of the working class are inflated by putting upon them indirect taxation, levied through channels in which profiteering is encouraged by the Government for political ends. Is it not time for the victorious and creditor country to take a leaf out of the book of the debtor? Our politicians and social reformers have the bit between their teeth, and need a strong curb from those who direct the wealth-producing undertakings of the country.

The Mechanical Basis of Physical Science.

An extract from the Presidential address to the British Association,
By Sir T. E. THORPE, C.B , D.Sc., F.R.S.

The molecular theory of matter—a theory which in its crudest form has descended to us from the earliest times, and which has been elaborated by various speculative thinkers through the intervening ages, scarcely rested upon an experimental basis until within the memory of men still living. When Lord Kelvin spoke at the British Association meeting in 1871, the best-established development of the molecular hypothesis was exhibited in the kinetic theory of gases as worked out by Joule, Clausius, and Clerk Maxwell. As he then said, no such comprehensive molecular theory had ever been even imagined before the nineteenth century; but, with the eye of faith, he clearly perceived that, definite and complete in its area as it was, it was "but a well-drawn part of a great chart, in which all physical science will be represented with every property of matter shown in dynamical relation to the whole. The prospect we now have of an early completion of this chart is based on the assumption of atoms; but there can be no permanent satisfaction to the mind in explaining heat, light, elasticity, diffusion, electricity and magnetism, in gases liquids and solids and describing precisely the relations of these different states of matter to one another by statistics of great numbers of atoms when the properties of the atom itself are simply assumed. When the theory, of which we have the first instalment in Clausius's and Maxwell's work, is complete, we are but brought face to face with a superlatively grand question: What is the inner mechanism of the atom?"

If the properties and affections of matter are dependent upon the inner mechanism of the atom, an atomic theory, to be valid, must comprehend and explain them all. There cannot be one kind of atom for the physicist and another for the chemist. The nature of chemical affinity and of valency, the modes of their action, the difference in characteristics of the chemical elements, even their number, internal constitution, periodic position, and

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

possible isotopic rearrangements must be accounted for and explained by it.

Fifty years ago chemists for the most part, rested in the comfortable belief of the existence of atoms in the restricted sense in which Dalton, as a legacy from Newton, had imagined them. Lord Kelvin, unlike the chemists, had never been in the habit of "evading questions as to the hardness or indivisibility of atoms by virtually assuming them to be infinitely small and infinitely numerous." Nor, on the other hand, did he realise, with Boscovich, the atom "as a mystic point endowed with inertia and the attribute of attracting or repelling other such centres." Science advances not so much by fundamental alterations in its beliefs as by additions to them. Dalton would equally have regarded the atom "as a piece of matter of measurable dimensions, with shape, motion, and laws of action, intelligible subjects of scientific investigation."

Dalton's Theory.

In spite of the fact that the atomic theory, as formulated by Dalton, has been generally accepted for nearly a century, it is only within the last few years that physicists have arrived at a conception of the structure of the atom sufficiently precise to be of service to chemists in connection with the relation between the properties of elements of different kinds, and in throwing light on the mechanism of chemical combination.

This further investigation of the "superlatively grand question—the inner mechanism of the atom"—has profoundly modified the basic conceptions of chemistry. It has led to a great extension of our views concerning the real nature of the chemical elements. The discovery of the electron, the production of helium in the radioactive disintegration of atoms, the recognition of the existence of isotopes, the possibility that all elementary atoms are composed either of helium atoms or of atoms of hydrogen and helium, and that these atoms, in their turn, are built up of two constituents, one of which is the electron, a particle of negative electricity the mass of which is only 1/1800 of that of an atom of hydrogen, and the other a particle of positive electricity the mass of which is practically identical with that of the same atom—the outcome, in short, of the collective work of Soddy, Rutherford, J. J. Thomson, Collie, Moseley, and others—are pregnant facts which have completely altered the fundamental aspects of the science. Chemical philosophy has in fact, now definitely entered on a new phase.

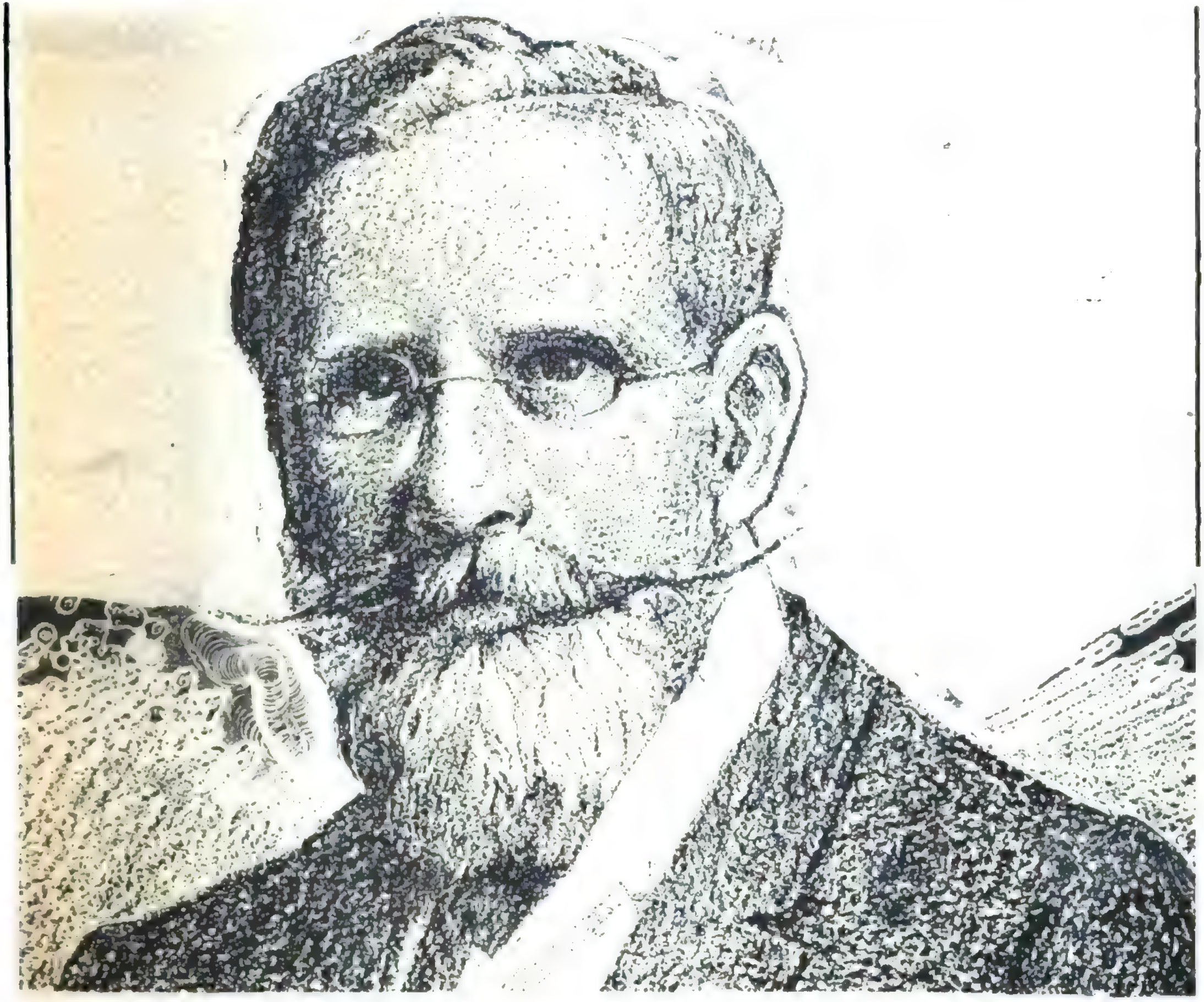
Looking back over the past, some indications of the coming change might have been perceived wholly unconnected, of course, with the recent experimental work which has served to ratify it. In a short paper entitled, "Speculative Ideas respecting the Constitution of Matter," originally published in 1863, Graham conceived that the various kinds of matter, now recognised as different elementary substances, may possess one and the same ultimate or atomic molecule existing in different conditions of movement. This idea, in its essence, may be said to be as old as the time of Leucippus. To Graham as to Leucippus, "the action of the atom as one substance taking various forms by combinations unlimited, was enough to account for all the phenomena of the world. By separation and union with constant motion all things could be done."

But Graham developed the conception by independent thought, and in the light of experimentally ascertained knowledge which the world owes to his labours. He might have been cognisant of the speculations of the Greeks, but there is no evidence that he was knowingly influenced by them. In his paper, Graham uses the terms "atom" and "molecule," if not exactly in the same sense that modern teaching demands, yet in a sense very different from that hitherto required by the limitations of contemporary chemical doctrine. He conceives of a lower order of atoms than the chemical atom of Dalton, and founds on his conception an explanation of chemical combination based upon a fixed combining measure, which he terms the *metron*, its relative weight being one for hydrogen, sixteen for oxygen, and so on with the other so-called "elements." Graham, in fact, like Davy before him, never committed himself to a belief in the indivisibility of the Daltonian atom. The original atom may, he thought, be far down.

The Primitive Atom.

The idea of a primordial ylé, or of the essential unity of matter, has persisted throughout the ages, and, in spite of much experimental work, some of it of the highest order, which was thought to have demolished it, it has survived, revivified and supported by analogies and arguments drawn from every field of natural inquiry. This idea, of course, was at the basis of the hypothesis of Prout, which, even as modified by Dumas, was held to be refuted by the monumental work of Stas. But as pointed out by Marignac and Dumas, anyone who will impartially look at the facts can scarcely escape the feeling that there must

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



Chance's CROOKES Glass

is the original, genuine Crookes Glass based upon the researches of one of the most eminent Scientists in History, developed by the constant research and experiment of manufacturers with considerably over a century's practical experience of glass making.

It is solely due to this research and experience that Chance's "Crookes" Glass of to-day has attained its present degree of perfection.

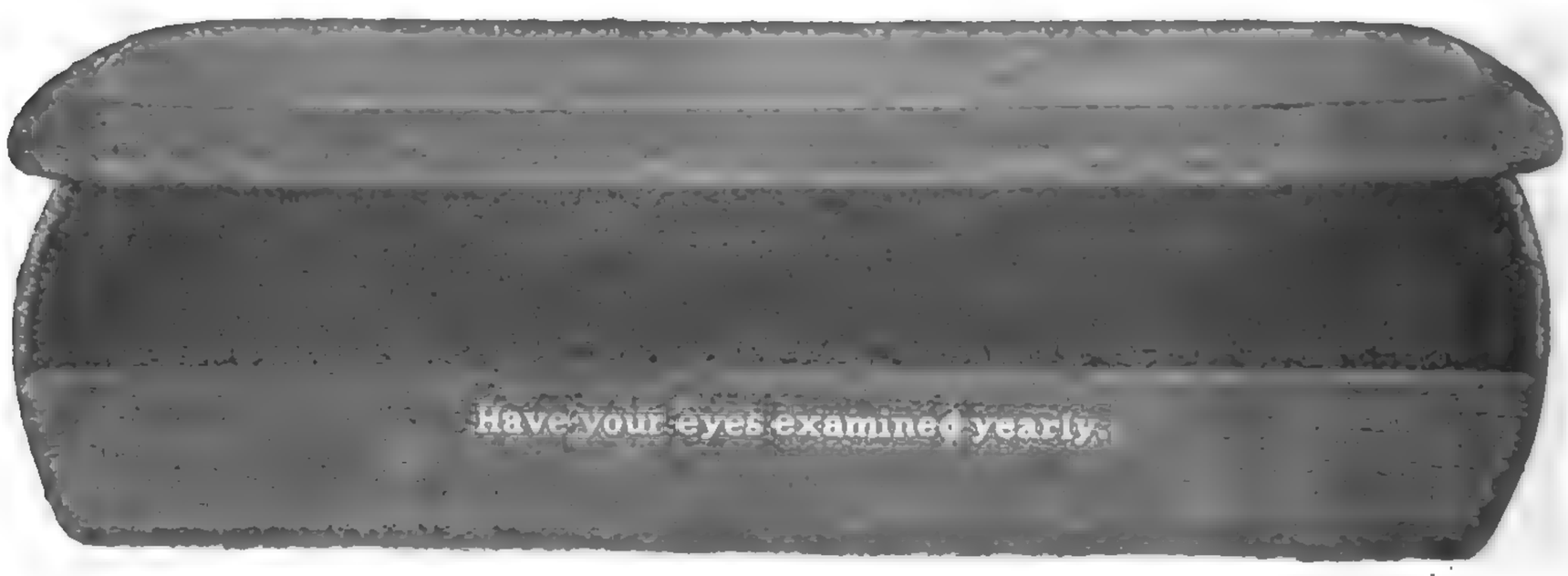
The prefix *Chance's* is the guarantee of its quality.

CHANCE BROS. & CO., LTD.,

GLASS WORKS, SMETHWICK, BIRMINGHAM.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Shur-on Glasses



Do You Supply Your Patrons The KIND of Case They Expect?

Of course, they rely upon your judgment and fairness to give them a high grade, dependable, good-looking case—one which truly bespeaks the character of your optical service. Therefore, the case they get is an asset or a liability to you, depending on its merit.

If you give them a Shur-on Case, it's a sure asset—"a case of satisfaction." Shur-on Cases are universally recognised for their unquestioned superiority: Prove this to your own satisfaction.

Write us for a FREE sample case, mentioning the name of your wholesaler. The case will speak for itself.

SHUR-ON OPTICAL Co.,
Rochester, N.Y., U.S.A.

Quality Beyond Question Since 1864

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

be some reason for the frequent recurrence of atomic weights differing by so little from the numbers required by the law which the work of Stas was supposed to disprove. The more exact study within recent years of the methods of determining atomic weights and the great improvement in experimental appliances and technique, combined with a more rigorous standard of accuracy demanded by a general recognition of the far-reaching importance of an exact knowledge of these physical constants, have resulted in intensifying the belief that some natural law must be at the basis of the fact that so many of the most carefully determined atomic weights on the oxygen standard are whole numbers.

Elemental Mixtures.

Nevertheless, there were well-authenticated exceptions which seemed to invalidate its universality. The proved fact that a so-called element may be a mixture of isotopes substances of the same chemical attributes, but of varying atomic weight— has thrown new light on the question. It is now recognised that the fractional values independently established in the case of any one element by the most accurate experimental work of various investigators are, in effect, "statistical quantities" dependent upon a mixture of isotopes. This result, indeed, is a necessary corollary of modern conceptions of the inner mechanism of the atom. The theory that all elementary atoms are composed of helium atoms, or of helium and hydrogen atoms, may be regarded as an extension of Prout's hypothesis, with, however, this important distinction, that whereas Prout's hypothesis was at best a surmise with little, and that little only weak, experimental evidence to support it, the new theory is directly deduced from well-established facts.

The hydrogen isotope, H_3, first detected by Sir J. J. Thomson, of which the existence has been confirmed by Aston, would seem to be an integral part of atomic structure. Rutherford by the disruption of oxygen and nitrogen, has also isolated a substance of mass 3 which enters into the structure of atomic nuclei but which he regards as an isotope of helium, which itself is built up of four hydrogen nuclei, together with two cementing electrons. The atomic nuclei of elements of even atomic number would appear to be composed of helium nuclei only, or of helium nuclei with cementing electrons; whereas those of elements of odd atomic number are made up of helium and hydrogen nuclei together with cementing electrons. In the case of the lighter elements of the latter class, the number of hydrogen nuclei associated with the helium nuclei is invariably three, except in that of nitrogen, where it is two. The frequent occurrence of this group of three hydrogen nuclei indicates that it is structurally an isotope of hydrogen with an atomic weight of three and a nuclear charge of one. It is surmised that it is identical with the hypothetical "nebulium" from which our "elements" are held by astrophysicists to be originally produced in the stars through hydrogen and helium.

These results are of extraordinary interest as bearing on the question of the essential unity of matter and the mode of genesis of the elements. Members of the British Association may recall the suggestive address on this subject of the late Sir William Crookes, delivered to the Chemical Section at the Birmingham meeting of 1886, in which he questioned whether there is absolute uniformity in the mass of the atoms of a chemical element, as postulated by Dalton. He thought, with Marignac and Schutzenberger, who had previously raised the same doubt, that it was not improbable that what we term an atomic weight merely represents a mean value around which the actual weights of the atoms vary within narrow limits, or, in other words, that the mean mass is "a statistical constant of great stability."

Crucial Experiment Needed.

No valid experimental evidence in support of this surmise was or could be offered at the time it was uttered. Maxwell pointed out that the phenomena of gaseous diffusion, as then ascertained, would seem to negative the supposition. If hydrogen, for example, were composed of atoms of varying mass it should be possible to separate the lighter from the heavier atoms by diffusion through a porous septum. "As no chemist," said Maxwell, "has yet obtained specimens of hydrogen differing in this way from other specimens, we conclude that all the molecules of hydrogen are of sensibly the same mass, and not merely that their mean mass is a statistical constant of great stability." * But against this it may be doubted whether any chemist had ever made experiments sufficiently precise to solve this point.

The work of Sir Norman Lockyer on the spectroscopic evidence for the dissociation of "elementary" matter at transcendental temperatures, and the possible synthetic intro-stellar production of elements, through the

* Clerk Maxwell, art. "Atom," 'Ency. Brit.,' 9th ed.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

helium of which he originally detected the existence, will also find its due place in the history of this new philosophy.

Analysis of Positive Rays.

Sir J. J. Thomson was the first to afford direct evidence that the atoms of an element, if not exactly of the same mass, were at least approximately so, by his method of analysis of positive rays. By an extension of this method Dr. F. W. Aston has succeeded in showing that a number of elements are in reality mixtures of isotopes. It has been proved, for example, that neon, which has a mean atomic weight of about 20.2, consists of two isotopes having the atomic weights respectively of 20 and 22, mixed in the proportion of 90 per cent. of the former with 10 per cent. of the latter. By fractional diffusion through a porous septum an apparent difference of density of 0.7 per cent. between the lightest and heaviest fractions was obtained. The kind of experiment which Maxwell imagined proved the invariability of the hydrogen atom has sufficed to show the converse in the case of neon.

The element chlorine has had its atomic weight repeatedly determined, and, for special reasons, with the highest attainable accuracy. On the oxygen standard it is 35.16, and this value is accurate to the second decimal place. All attempts to prove that it is a whole number—35 or 36—have failed. When, however, the gas is analysed by the same method as that used in the case of neon it is found to consist of at least two isotopes of relative mass 35 and 37. There is no evidence whatever of an individual substance having the atomic weight 35.46.

Hence chlorine is to be regarded as a complex element consisting of two principal isotopes of atomic weights 35 and 37 present in such proportion as to afford the mean mass 35.16. The atomic weight of chlorine has been so frequently determined by various observers and by various methods with practically indentical results that it seems difficult to believe that it consists of isotopes present in definite and invariable proportion. Dr. Aston meets this objection by pointing out that all the accurate determinations have been made with chlorine derived originally from the same source, the sea, which has been perfectly mixed for æons. If samples of the element could be obtained from some other original source, it is possible that other values of atomic weight would be obtained, exactly as in the case of lead, in which the existence of isotopes in the metal found in various radioactive minerals was first conclusively established.

Argon, which has an atomic weight of 39.88, was found to consist mainly of an isotope having an atomic weight of 40, associated to the extent of about 3 per cent. with an isotope of atomic weight 36. Krypton and xenon are far more complex. The former would appear to consist of six isotopes, 78, 80, 82, 83, 84, 86; the latter of five isotopes, 129, 131, 132, 134, 136.

Fluorine is a simple element of atomic weight 19. Bromine consists of equal quantities of two isotopes, 79 and 81. Iodine, on the contrary, would appear to be a simple element of atomic weight 127. The case of tellurium is of special interest in view of its periodic relation to iodine, but the results of its examination up to the present are indefinite.

Boron and silicon are complex elements, each consisting of two isotopes, 10 and 11, and 28 and 29, respectively.

Sulphur, phosphorus, and arsenic are apparently simple elements. Their accepted atomic weights are practically integers.

Mercury, a Complex Element.

All this work is so recent that there has been little opportunity, as yet, of extending it to any considerable number of the metallic elements. These, as will be obvious from the nature of the methods employed, present special difficulties. It is, however, highly probable that mercury is a mixed element consisting of many isotopes. These have been partially separated by Brönsted and Hevesy by fractional distillation at very low pressures, and have been shown to vary very slightly in density. Lithium is found to consist of two isotopes, 6 and 7. Sodium is simple, potassium and rubidium are complex, each of the two latter elements consisting, apparently, of two isotopes. The accepted atomic weight of cæsium, 132.81, would indicate complexity, but the mass spectrum shows only one line at 133. Should this be confirmed, cæsium would afford an excellent test case. The accepted value for the atomic weight is sufficiently far removed from a whole number to render further investigation desirable.

This imperfect summary of Dr. Aston's work is mainly based upon the account he recently gave to the Chemical Society. At the close of his lecture he pointed out the significance of the results in relation to the periodic law. It is clear that the order of the chemical or "mean" atomic weights in the periodic

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

"Stork"

Automatic Eyeglass

BRITISH MADE.

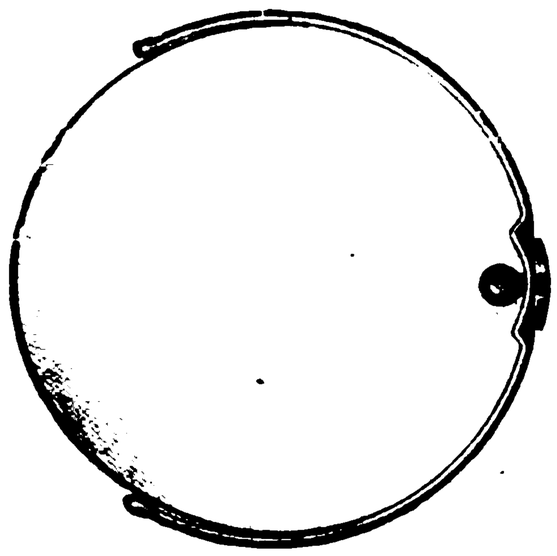
Holder

PAT. APPD. FOR

Constructed on an Entirely New Principle, this chain is Mechanically Perfect.

It embodies all the essentials of the reliable eyeglass holder and is a chain that can be recommended with confidence.

Strongly made yet neat and well-finished. Action combining simplicity with Certainty. Locking Bolt makes accidental recoil of chain impossible. British Made and reasonable in price. Chain can be worn at any length.



The "COURT" Invisible Gallery Oxford.

Adaptable to any Size or Shape of Eye.
Made in 9ct. Gold.

Rd. No. 682819.

Samples and prices sent on application to

WALTER H. THOMPSON,

: 66, HATTON GARDEN, E.C. 1 :

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713 (Two Lines).

Digitized by Google Original from THE OHIO STATE UNIVERSITY

THE
GLASSIE
LENS CLEANER

Your Name and Speciality printed here. The "Glassie" becomes your invaluable business bringer.

Your Silent Salesman!

It is conveniently carried in the spectacle case, therefore is always in front of the people in whom you are most interested.

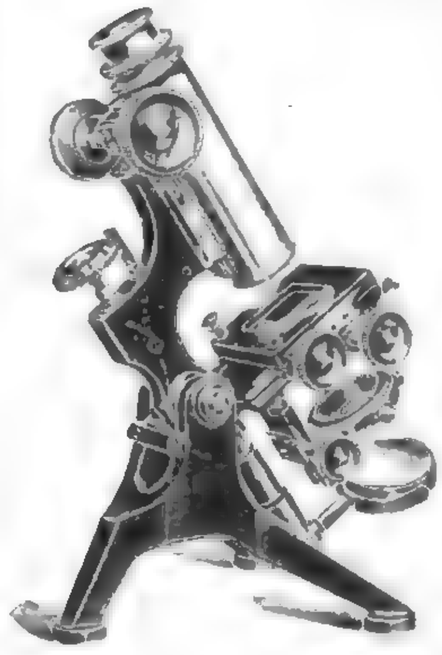
A constant reminder of you.

Can be obtained from your Jobber or direct from

THE GLASSIE LENS CLEANER Co
156 CHARING CROSS ROAD. LONDON. W.C.2.

SELL WATSONS'
BRITISH-MADE
MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,
313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1837

FOUND

AT 36, GRAY'S INN ROAD, LONDON, W.C. 1, A HOUSE THAT CAN GIVE YOU AN

EXCELLENT RX SERVICE

Combined with

SPEED, ACCURACY & INDIVIDUAL ATTENTION.

If you are looking for a house of this description, send a few trial orders and be

REWARDED

KIRK BROTHERS
WHOLESALE & MANUFACTURING OPTICIANS

36, GRAY'S INN ROAD, LONDON, W.C.1

Telephone: HOLBORN 1620 (Private Exchange). Telegrams: KIRBROREX, HOLB. LONDON.

Price List and Prescription Book on Application.

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

table has no practical significance; anomalous cases, such as argon and potassium, are simply due to the relative proportions of their heavier and lighter isotopes. This does not necessarily invalidate or even weaken the periodic law, which still remains the expression of a great natural truth. That the expression as Mendeléeff left it is imperfect has long been recognised. The new light we have now gained has gone far to clear up much that was anomalous, especially Moseley's discovery that the real sequence is the atomic number, not the atomic weight. This is one more illustration of the fact that science advances by additions to its beliefs rather than by fundamental or revolutionary changes in them.

Protyle.

The bearing of the electronic theory of matter, too, on Prout's discarded hypothesis that the atoms of all elements were themselves built up of a primordial atom—his *protyle*, which he regarded as probably identical with hydrogen—is too obvious to need pointing out. In a sense, Prout's hypothesis may be said to be now re-established, but with this essential modification—the primordial atoms he imagined are complex and are of two kinds—atoms of positive and negative electricity—respectively known as protons and electrons. These, in Dr. Aston's words, are the standard bricks that Nature employs in her operations of element building.

The true value of any theory consists in its comprehensiveness and sufficiency. As applied to chemistry, this theory of "the inner mechanism of the atom" must explain all its phenomena. We owe to Sir. J. J. Thomson its extension to the explanation of the periodic law, the atomic number of an element, and of that varying power of chemical combination in an element we term valency. This explanation I give substantially in his own words. The number of electrons in an atom of the different elements has now been determined, and has been found to be equal to the atomic number of the element, that is to the position which the element occupies in the series when the elements are arranged in the order of their atomic weights. We know now the nature and quantity of the materials of which the atoms are made up. The properties of the atom will depend not only upon these factors, but also upon the way in which the electrons are arranged in the atom. This arrangement will depend on the forces between the electrons themselves and also on those between the electrons and the positive charges or protons.

One arrangement which naturally suggested itself is that the positive charges should be at the centre with the negative electrons around it on the surface of a sphere. Mathematical investigation shows that this is a possible arrangement if the electrons on the sphere are not too crowded. The mutual repulsion of the electrons resents overcrowding, and Sir J. J. Thomson has shown that when there are more than a certain number of electrons on the sphere, the attraction of a positive charge, limited as in the case of the atom in magnitude to the sum of the charges on the electrons is not able to keep the electrons in stable equilibrium on the sphere, the layer of electrons explodes, and a new arrangement is formed. The number of electrons which can be accommodated on the outer layer will depend upon the law of force between the positive charge and the electrons. Sir J. J. Thomson has shown that this number will be eight with a law of force of a simple type.

To show the bearing of this result as affording an explanation of the periodic law, let us, to begin with, take the case of the atom of lithium, which is supposed to have one electron in the outer layer. As each element has one more free electron in its atom than its predecessor, glucinum, the element next in succession to lithium, will have two electrons in the outer layer of its atom, boron will have three, carbon four, nitrogen five, oxygen six, flourine seven and neon eight. As there cannot be more than eight electrons in the outer layer, the additional electron in the atom of the next element, sodium, cannot find room in the same layer as the other electrons, but will go outside, and thus the atom of sodium, like that of lithium will have one electron in its outer layer. The additional electron, in the atom of the next element magnesium, will join this, and the atom of magnesium, like that of glucinum, will have two electrons in the outer layer.

The Periodic Law.

Again, aluminium, like boron, will have three; silicon, like carbon, four; phosphorous, like nitrogen, five; sulphur, like oxygen, six; chlorine, like fluorine, seven; and argon, like neon eight. The sequence will then begin again. Thus the number of electrons, one, two, three, up to eight, in the outer layer of the atom, will recur periodically as we proceed from one element to another in the order of their atomic weights, so that any property of an element which depends on the number of electrons in the outer layer of its atom will also recur periodically, which is precisely that re-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

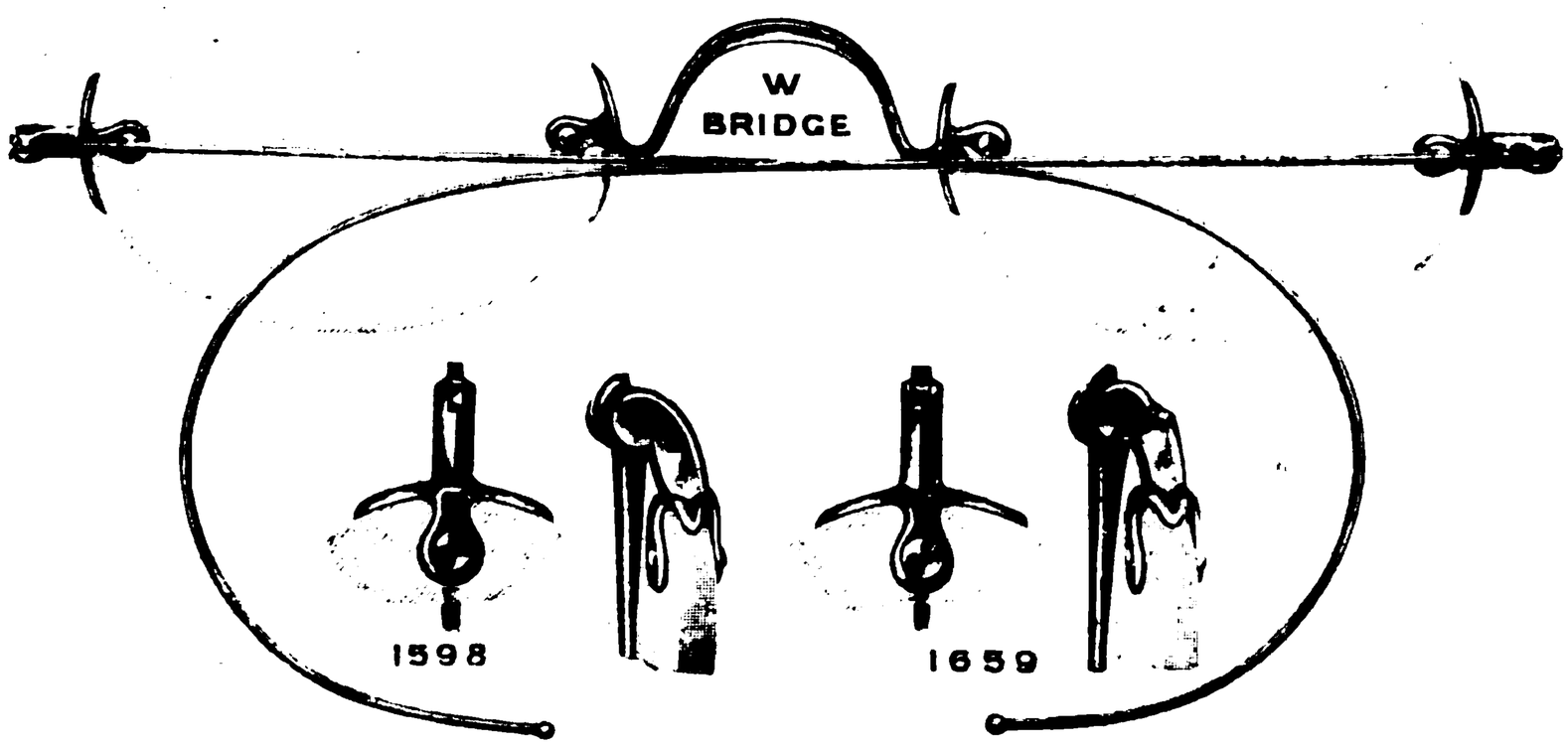
QUALITY FIRST

DUPAUL, YOUNG OPTICAL CO.,

ESTABLISHED 1888.

SOUTHBRIDGE, MASS., U.S.A.

Manufacture only Guaranteed Quality and Best Finish Gold-Filled and White Metal Spectacles, Eyeglass Frames, Astigs, Mountings and Materials.



To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

"BISHOP QUALITY"

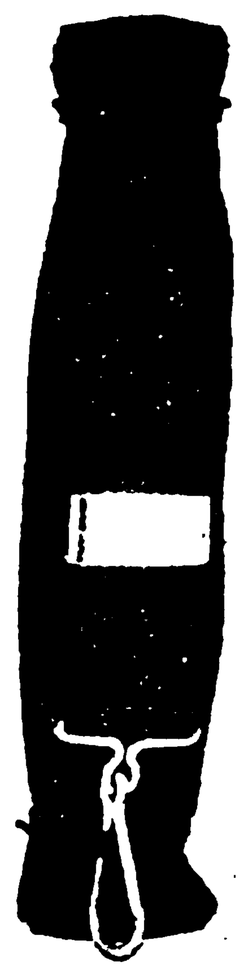


14-L

SILK EYEGLASS CORDS AND MONOCLE RIBBONS.

With Gold Filled, Silver or Gun Metal snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.



16-L

THE BISHOP COMPANY,
North Attleboro, Mass., U.S.A.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

markable property of the elements which is expressed by the periodic law of Mendeléeff, or the law of octaves of Newlands.

Valency.

The valency of the elements, like their periodicity, is a consequence of the principle that equilibrium becomes unstable when there are more than eight electrons in the outer layer of the atom. For on this view the chemical combination between two atoms, A and B, consists in the electrons of A getting linked up with those of B. Consider an atom like that of neon, which has already eight electrons in its outer layer; it cannot find room for any more, so that no atoms can be linked to it, and thus it cannot form any compounds. Now take an atom of fluorine, which has seven electrons in its outer layer; it can find room for one, but only one, electron, so that it can unite with one, but not with more than one, atom of an element like hydrogen which has one electron in the outer layer.

Fluorine accordingly, is monovalent. The oxygen atom has six electrons; it has, therefore, room for two more, and so can link up with two atoms of hydrogen; hence oxygen is divalent. Similarly nitrogen, which has five electrons and three vacant places, will be trivalent, and so on. On this view an element should have two valencies, the sum of the two being equal to eight. Thus, to take oxygen as an example, it has only two vacant places, and so can find room only for the electrons of two atoms; it has, however, six electrons available for filling up the vacant places in other atoms, and as there is only one vacancy to be filled in a fluorine atom the electrons in an oxygen atom could fill up the vacancies in six fluorine atoms, and thereby attach these atoms to it. A fluoride of oxygen of this composition remains to be discovered, but its analogue, SF_6, first made known by Moissan, is a compound of this type. The existence of two valencies for an element is in accordance with views put forward some time ago by Abegg and Bödlander. Prof. Lewis and Dr. Irving Langmuir have developed, with great ingenuity and success, the consequences which follow from the hypothesis that an octet of electrons surrounds the atoms in chemical compounds.

The term "atomic weight" has thus acquired for the chemist an altogether new and much wider significance. It has long been recognised that it has a far deeper import than as a constant useful in chemical arithmetic. For the ordinary purposes of quantitative analysis, of technology, and of trade, these constants may be said to be now known with sufficient accuracy; but, in view of their bearing on the great problem of the essential nature of matter and on the "superlatively grand question, What is the inner mechanism of the atom?" they become of supreme importance. Their determination and study must now be approached from entirely new points of view and by the conjoint action of chemists and physicists. The existence of isotopes has enormously widened the horizon. At first sight it would appear that we should require to know as many atomic weights as there are isotopes, and the chemist may well be appalled at such a prospect. All sorts of difficulties start up to affright him, such as the present impossibility of isolating isotopes in a state of individuality, their possible instability, and the inability of his quantitative methods to establish accurately the relatively small differences to be anticipated. All this would seem to make for complexity. On the other hand, it may eventually tend towards simplification.

If, with the aid of the physicist, we can unravel the nature and configuration of the atom of any particular element, and determine the number and relative arrangement of the constituent protons and electrons, it may be possible to arrive at the atomic weight by simple calculation, on the assumption that the integer rule is mathematically valid. This, however, is almost certainly not the case, owing to the influence of "packing." The little differences in fact, may make all the difference. The case is analogous to that of the so-called gaseous laws in which the departures from their mathematical expression have been the means of elucidating the physical constitution of the gases and of throwing light upon such variations in their behaviour as have been observed to occur. There would appear, therefore, ample scope for the chemist in determining with the highest attainable accuracy the departures from the whole-number rule, since it is evident that much depends upon their exact extent.

An Annual Report.

These considerations have already engaged the attention of chemists. For some years past a small International Committee, originally appointed in 1903, has made and published an annual report in which they have noted such determinations of atomic weight as have been made during the year preceding each report, and they have from time to time made suggestions for the amendment of the tables of atomic weights, published in text-books and chemical journals, and in use in chemical

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

ALUMINIUM SPECTACLE CASES.

WHOLESALE ONLY.

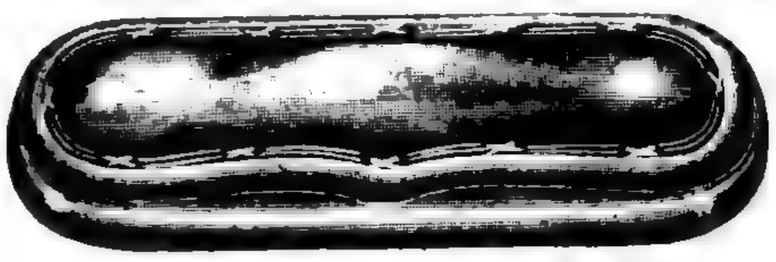
JULES LANG & SON have pleasure in submitting to the Trade a few illustrations of their various patterns, and invite your enquiries for your Autumn requirements. Prompt delivery from stock.

Nos. 1—10—20.



Plain, Plain with Fancy Border and Embossed.
Astig 2—1—0 Eye.

No. 110.



Fingerpiece Extra Large Curl Side.

WELL-FINISHED WITH STRONG SPRING LIDS. CHAMOIS LINED

—o—

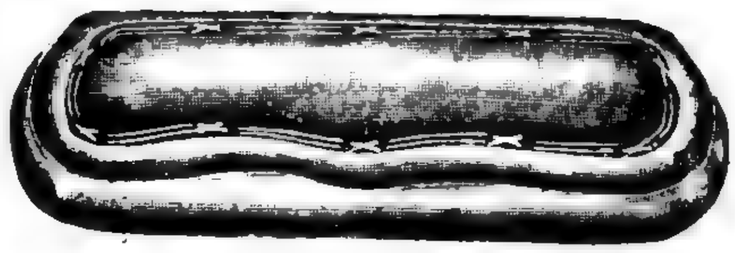
PHONE OR WRITE for FULL ILLUSTRATED LIST OF THESE CASES.

Nos. 14—24.



Oxydised Astig.

No. 210.



Round Eye Fingerpiece.
2—1—0 Eye.

JULES LANG & SON,

CHARLTON WORKS, CHARLTON PLACE, ISLINGTON, LONDON, N.1

'phone—NORTH 2770-2 (3 lines). Telegrams—"ASSORTED" phone Lon.

NORTHAMPTON POLYTECHNIC INSTITUTE,

Clerkenwell, London, E.C.1

DEPARTMENT OF OPTICAL ENGINEERING & APPLIED OPTICS

SESSION 1921-22.

TECHNICAL DAY COURSES

FOR **OPTICIANS** AND

OPTICAL INSTRUMENT MAKERS.

Whole-time day courses in optical work will commence at the Institute on Monday, 3rd October, 1921. **Entrance Examinations,** 27th and 28th September, 1921. These courses are specially adapted to meet the varied requirements of the optical trade.

Should a sufficient number of students apply for enrolment, day apprentices classes will also be held, each student attending alternate weeks for one week continuously.

EVENING TECHNICAL COURSES

for Opticians and Optical Instrument Makers will be offered, the session, for these courses commencing on Monday, 26th September, with enrolments during the preceding week.

Full particulars as to fees, dates, &c., and all information respecting the above courses and also the Engineering and other work of the Institute, can be obtained at the Institute, or on application to—

R. MULLINEUX WALMSLEY, D.Sc., *Principa*

F. PARKER WOOD,

Wholesale Manufacturing Optician,

47, MARK LANE, E.C.3

Immediate delivery from stock:

TELESCOPES
FIELD GLASSES
PRISM GLASSES
MICROSCOPES
ANEROIDS & CLOCKS
BAROGRAPHS
SEXTANTS
BINNACLES
COMPASSES

CHRONOMETERS, New & Second-hand

Repairs a Speciality.
Clinicals and all other Thermometers.

PARALLEL GLASSES of every description.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Key to Successful Business is the Trade Paper.

If you advertise, the trade paper gives you a 100 per cent. market; all the readers have a direct business interest in your goods, there is no waste circulation.

If you subscribe, it gives you the latest trade news and technical information. To-day, it is more necessary than ever to be up-to-date in your business; the trade paper will keep you posted. Here are some progressive journals which offer you valuable service as an advertiser, or as a reader.

Aeroplane (London).
Agricultural Gazette (London).
Art Trade Journal (London).
Auto-Cyclist (Sydney).
Automobile Engineer (London).
Auto-Motor Journal (London).
Baker's Confectioners' and Caterers' National Association Review (Lond.)
Bioscope (London).
Box Makers' Journal (Manchester).
Brewers' Gazette (London).
Brick and Pottery Trades' Journal (London).
British and Colonial Mineral Water Trade Journal (Cardiff).
British and Colonial Pharmacist (London).
British Baker (London).
British Builder (London).
British Journal of Photography (London).
Chemical News (London).
China Clay Trade Review (London).
Confectionery Journal (London).
Cooper's Vehicle Journal (London).
Corn Trade News (Liverpool).
Dairy & Creamery Journal (London).
Dairyman (London).
Decorator (London).
Drapers' Organiser (London).
Electric Vehicle (London).
Electrical Industries and Investments (London).
Electricity (London).
Electrics (London).
Engineering Production (London).
Engineering Review (London).
Engineering World (Manchester).
Fancy Goods Record (London).
Fertiliser and Feeding Stuffs Journal (London).
Flight and The Aircraft Engineer (London).
Footwear Organiser (London).
Freemason and Masonic Illustrated (London).
Furnishing Trades' Organiser (London).
Furniture Record and the Furnisher (London).
Games and Toys (London).
Gas and Oil Power (London).
Hardwareman and Ironmonger's Chronicle (London).
Ice and Cold Storage (London).
India Rubber Journal (London).
Indian Industries and Power (Bombay and Calcutta).
Indian Medical Gazette (Calcutta).
Indian Motor News (Bombay and Calcutta).
Indian and Eastern Engineer (Calcutta).
Journal of Decorative Art (Manchester).
Licensing World (London).
"Locomotive" & Railway Carriage and Wagon Review (London).
Managing Engineer (London).
Marine Engineer & Naval Architect (London).
Mechanical World (Manchester and London).
Milling (Liverpool).
Model Engineer and Electrician (London).
Motor Cycle and Cycle Trader (London).
Motor Export Trader (London).
Motor in Australia (Sydney).
Motor Magazine of Canada (Toronto)
Motor Trade of Canada (Toronto).
Motor Trader & Review (London).
Motoring in South Africa (Cape Town).
Motorist & Wheelman (Perth, W.A.).
Music Trades Review (London).
N.Z. Motor Journal (Auckland, N.Z.).
Optician and Scientific Instrument Maker (London).
Organizer (London).
Outfitter (London).
Paper Box and Bag Maker (London.)
Paper Container (London).
Paper Maker & British Paper Trade Journal (London).
Photographic Dealer (London).
Power Laundry (London).
South African Motorist (Johannesburg).
South Australian Motor (Adelaide, S. Australia).
Sports Trades Journal (London).
Stationery World and Fancy Goods Review (London).
Steering Wheel (Brisbane).
Stone Trades' Journal (London).
Sugar Journal, International (London).
Talking Machine News (London).
Textile Manufacturer (Manchester).
Textile Mercury (Manchester).
Textile Recorder (Manchester).
Toyshop and Fancy-Goods Journal (London).
Waste Trade World (London).
W.A. Motorist (Perth, W.A.).
Wireless World (London).
World's Carriers' & Carrying Trades' Review (London).

The address of any Paper in this list may be obtained from the Secretary of the

British Association of Trade & Technical Journals, Ltd.,

Sicilian House,
Southampton Row.

London, W.C. 1

Telephone No.:
Holborn 395

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

laboratories. In view of recent developments, the time has now arrived when the work of this International Committee must be re-organised and its aims and functions extended. The mode in which this should be done has been discussed at the meeting in Brussels, in June last, of the International Union of Chemistry Pure and Applied, and has resulted in strengthening the constitution of the Committee and in a wide extension of its scope.

The United Kingdom Optical Co.'s Ophthalmic Lenses.

Standardised Base Curves and Equivalent Powers.

The increase in the prescribing of meniscus and toric lenses makes it important to call attention to the question of standardisation. It is now quite accepted that these are a great improvement upon flat forms, and many articles have been published in these columns on Best Form Lenses. The fact remains that whilst lenses with very deep base curves, varying with the power, are in general more perfect in helping to form the image on the retina, yet the term best form is debatable, as another factor, that of comfort, must be taken into consideration. In spite of all that has been said for the extra-deep forms they are not popular. Leaving out the question of best appearance the chief objection adduced is the annoyance from reflected images, which often gives a Pepper's Ghost effect. Consequently the most generally prescribed is the 6 diopter base curve, the demand for which is so regular that it is an accepted standard for low powers, with changes to 3 or 4 diopter base curve, or to 8, 9 or 10 diopter for powers above medium.

But there is another aspect of standardisation to which sufficient attention has not yet been given, that of the standard of power. The accepted standard of power adopted by the Optical Society applies to flat form lenses; and if lenses in meniscus form are prescribed after testing with lenses from the ordinary trial-cases, satisfaction cannot always be expected unless there is introduced the modification necessary to make the lenses of such a power that they will produce at the cornea the same wave front as the trial-case lens used in testing. The variation in power due to nodal points of meniscus form lenses being outside the lens is well-known to manufacturers, and often allowance is made for it; but the practice of testing such lenses by neutralisation causes confusion, except in very low powers where the difference can often be ignored.

The question of a standard, therefore, is still controversial, but we are pleased to announce that an attempt is made towards one by the United Kingdom Optical Co., Ltd., at Mill Hill. The increase in orders for these lenses makes it necessary to state that their meniscus and toric lenses have all been made to a standard which, in general terms, may be stated as follows:—

They are made with a power to produce at the cornea the same wave-front as standard trial-case lenses if considered as worn 15 millimeters from the eye.

The knowledge of this will allow opticians and oculists to prescribe their meniscus form lenses without fear. The United Kingdom Optical Company's list shows that toric lenses are now being made by them in a large variety of base-curves, to enable almost all Rx to be produced with the best appearance and effect.

We have had in hand for some little time an important article, "An Optical Nomogram," by Mr. J. A. Tomkins, A.R.C.S., held over on account of considerations of space which is to be printed in the near future.

Mr. W. G. Wickham, H.M. Senior Trade Commissioner in South Africa, will make a tour of the Provinces commencing in Leicester (Sept. 19-21), and extending to Nottingham (Sept. 22-23), Sheffield (Sept. 28-30), Leeds (Oct. 3-5), and Bradford (Oct. 6-11). Firms desiring to interview Mr. Wickham are requested to notify immediately the Secretary of the local Chamber of Commerce.

We regret to learn that Mr. C. S. Pyser, the managing director of the Mayfair Optical Co., Ltd., has met with a somewhat serious accident. Mr. Pyser was spending his vacation motoring in Devonshire when the car met with a mishap, the result being that he sustained both a fractured arm and a fractured leg. An operation had to be performed, but we are glad to hear that Mr. Pyser is making quite satisfactory progress towards recovery.

Matter intended for the current weeks' "Optician" must reach this office on the Tuesday morning preceding publication.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Movements of the Eyes During Reading.

Most persons have quite erroneous notions as to what their eyes do while engaged in the act of reading. Ordinarily we are unconscious of the movements of our eyes except when these movements are rather wide or when we indirectly infer their existence from the change in the objects seen. We know that we cannot read an ordinary line of print without moving our eyes in some manner along the lines, but introspection gives us little information concerning the nature of the movements.

Apparently no one prior to 1879 ever mentioned the fact that eye movement, as in the act of reading, is not continuous but rather discontinuous. It was the great French savant, Prof. Javal of the University of Paris, who cal'ed attention to this fact. Javal, in company with Lamare, conducted by simple methods a number of studies of eye movements from which it was concluded that the eye moved over the line in a series of jerks interrupted by pauses and that no reading was done except during the pauses. By attaching a microphone to the eyelids he could hear the faint rustling sound made by the cornea against the lids and he estimated that the pauses came about once every ten letters. He also believed, from experiments made in reading lines cut in halves horizontally, that the upper part of the line was more important than the lower part, and that the point at which the reader's gaze was directed, *i.e.*, the fixation point, was slightly above the middle of the horizontal line of letters and that it did not waver above or below the line itself. The 'American Journal of Physiological Optics,' from which this article is quoted, says that most of the above mentioned inferences have not been substantiated by later experiments.

In 1891, Landolt published results obtained by watching the movements of the eye in a mirror. His experiments showed that in reading a foreign language, numbers, lists of proper names or disconnected words in general, more fixations were needed. He concluded that 1.5 words, on the average, were read at each fixation.

Several attempts were made by various experimenters to attach recording apparatus directly to the cornea of the eye. Finally, in 1898, Prof. Delabarre, of Brown University, succeeded in improving this method and secured tracings of ocular movements, though not of the movements during reading.

These ideas were carried further by Huey, who, working at Clark University, attached a very light plaster of paris cup directly to the cornea and recorded the eye movements by a system of light beams which were so arranged in conjunction with suitable electrical devices as to provide a measurement in small fractions of a second of the time used up by an eye in the movements of reading. The results obtained by Huey and which are of interest to us include:—(1) In reading relatively long lines of magazines, the average number of fixations is about 4.5 per line; (2) Doubling the distance from the eye to the page does not affect the number of fixations; (3) Minor modifications in the size of the type do not affect the number of fixations; (4) The duration of the reading pauses, though extremely variable, averages about 0.19 second; (5) Fast reading entails fewer and shorter stops or pauses, but not faster movements; (6) A short line, *e.g.*, about 60 mm., makes possible fewer pauses, relatively, so that more is read with the single pause; (7) The movements forward, *i.e.*, from left to right, are quite constant at 0.042 to 0.048 second; (8) The movements of return, *i.e.*, from the right end of a line to the left end of the next line, are quite constant at 0.051 to 0.058 second. It has been found by later work that these last two generalisations are incorrect, since these time periods are too long.

Erdmann and Dodge in 1908 published the results of experiments performed at the University of Halle. Their conclusions are: (1) The number of pauses for reading is fairly constant for the same reader using the same material, but is affected decidedly by length of line, by difficulty of material read and by the personal equation of the reader: (2) The first fixation is not at the extreme left end of the line, but a short distance from this end, while the last fixation, similarly, is often not at the extreme right end but at a short distance from that end: (3) The fixations seem to be on words and usually on the middle of a word (a conclusion which does not seem, in some respects, to have been borne out by later experimentation): (4) Of the entire time spent in reading from 12/13 to 23/24 is devoted to the pauses, the remainder to the eye movements: (5) It is extremely doubtful if anything is perceived during the movement.

From 1900 on, Prof. Dodge developed at Wesleyan University a new and vastly superior method of reading, recording and measuring

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Modern Methods for Modern Business.

UTILISING the **L.O.C.** Service is the up-to-date method of dealing with Rx orders.

Sight-testing opticians all over the country are realising this. They are appreciating the fact that by allowing us to effect the mechanical interpretation of their requirements, they are economising time and money and, at the same time, ensuring workmanship of the highest order.

For the **L.O.C.** Service is essentially a modern Service. We claim it to be as near efficiency as a Service of this kind can be at the present time. An up-to-date workshop, fitted with the latest equipment; a skilled staff, supervisors with a knowledge extending to just where scientific research in their own line of work has for the moment reached; a system of dealing with orders that ensures immediate attention and earliest possible delivery; the entire organisation closely controlled by principals and technical experts.

It stands to reason that co-operation between us is going to help you. Our Service is being widely used and appreciated and we feel sure that a trial with your Rx orders will ensure our being permanently associated.

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris, France.

Also at—2, Str-Bursei, Bucharest, Roumania.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

BUY
PREMEX
LENSES

Warranted the
HIGHEST GRADE
100% 1st Quality.

THE SEYMOUR WHOLESALE
OPTICAL CO.,
3-4, BARRETT ST, MANCHESTER SQ.,
LONDON, W.1

BLUE GOLD
Well hardly that, but we can do
White or Yellow.
Write for samples and Prices. Rimmed and Rimless. Style and finish guaranteed.
IT WILL PAY YOU.
HAMPTON OPTICAL CO., Ltd.,
28, ESSEX STREET, BIRMINGHAM.

Canadian Goggles.
American Styles, made in Canada to supply demand for British goods. A full line of colored lensed goggles in metal and zylo frames, with and without leather, metal and collapsible dust shields for motor, motorcycle, all out-doors, all industrial uses.
Send for Catalogs or Samples.
CANADIAN GOGGLE Co.,
Manufacturers,
57-39 King William St., HAMILTON, ONT.

C. SWAIN, Ltd.,
51, Strand, London.
A B C Code 5th Ed.
'Phone:—GERRARD 5178. Factory: FOREST GATE.
UNCUT
Sphs
Sph Cyls
Plano Cyls
A.O.C. EDGED
Peris & Bi
Cx & Co etc.,
at Best Prices.

Scientific Instrument Makers.
MICROSCOPES of all kinds manufactured at our own works.
REPAIRS to Prismatic and other Binoculars etc., promptly executed.
H. H. SHARLAND (H. KEMP),
9 & 10, THAVIES INN, HOLBORN CIRCUS, LONDON, E.C.
Tel.: Holborn 4840. Established 1864.
Every Description of Ophthalmic Supplies.
All Requirements of the up-to-date Sight Testing Optician.
Good Special Lines at keenly Competitive Prices.

TO LENS MANUFACTURERS
For Disposal (In Perfect Condition)
1 12 Spindle Machine for Bi & Cy/L Lenses
1 20 „ „ „ Meniscus „
1 10 „ „ „ Deep Bi, Peris & Meniscus Lenses
Together with Blocks. Also a large quantityof White Blanks (Ovals and Rounds), And Dropped Blanks.
Full particulars on application to Box 3454, c/o "The Optician," 125, Fleet Street, E.C.4

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

eye movements in reading. In this device, the cornea of the eye was illuminated by an actinically powerful beam of light and the moving cornea was photographed through a narrow slit upon a very sensitive plate arranged to fall vertically at a constant and controllable speed. No inconvenience is experienced by the reader, but the precision is such as to enable the exact location of the fixation to be subsequently located upon the printed page to within an error of one small letter. He showed that the speed of the forward movements averaged about twenty-five thousandths of a second, while the speed of the return movements was of the order of forty-thousandths of a second.

W. F. Dearborn employed Dodge's photographic method in work carried out at Columbia University, and in 1906 published the latest information which we have at hand on the work done by the eye muscles in the process of reading and from it the following summary of results may be obtained, as pointed out by Prof. Whipple of Cornell University.

Conclusions.

1. The speed of forward movements determined by Dodge is confirmed: they are then nearly twice as fast as Huey reported, and it follows that no reading is done, or could be done, during these movements.

2. The duration of the fixation pauses is, roughly speaking, around one-fifth second; thus, in reading a newspaper column, four readers averaged 161, 216, 255 and 402 thousandths of a second, respectively. The duration is, therefore, different with different readers and is found to play an important part in conditioning their speed of reading. When the same reader is able to reduce the number of pauses, the duration of each pause tends to increase, but relatively there is a saving of time.

3. For a line 96.5 mm. long, there were on the average of 7.45 fixations, so that 1.6 words were read per fixation.

4. Fixation is not absolute and constant, but only approximate; in other words, the eye often makes slow gradual changes of position during a fixation.

5. Likewise, fixation is not extremely precise with regard to the position vertically along the line; it is not as Javal thought, confined to a straight line between the middle and top of the small letters, but wavers slightly up and down, and these inaccuracies increase, seemingly, when the line is long, the type small or the leading too narrow.

6. Again, the forward jerks may be interrupted by backward movements, regressive movements, or fixations. These retracements are most common at the beginning of a line and in the first few lines of a passage, so that they indicate a preliminary difficulty in locating the left-hand margin, which is later on overcome as the eye gets habituated to the mechanical arrangement of the prining before it. It follows that the practice of breaking up the left-hand margin of the prining, as is so frequently done in primers and readers, is injurious, because it presents an unnecessary obstacle to the work of the eye. There are also occasional movements of re-fixation which seem to be due to the eye having run forward too rapidly for the assimilation of meaning.

7. The first and last fixations do generally fall within the edges of the printed page, but this varies somewhat with the reader and with the particular character of the words lying at either end of the line.

8. Fixation is not, as previously supposed, in the middle of words, but may be in practically any place within a word, or in spacing between words, nor does it fall more frequently in the first part than in the last part of a sentence. The precise spot at which the gaze is directed is, then, indifferent as it is merely the middle of an area of clear vision.

Some Determining Factors.

9. It is possible, however, to show certain factors that determine the fixating of a given area. Thus, short connective and non-substantive words, prepositional phrases and relative clauses make the greatest demand on appereception, so that lines having many such phrases or words demand a large number of pauses. This is because these terms are not regularly associated into larger phrase units and must be separately attended to, unless the context makes the reader prepared or expectant for a particular collocation. Again, for some readers, the typography of the line may condition the precise location of fixation; capitals, dashes, punctuation marks, the so-called "dominating" letters—all tend to "hold up" the eye.

10. Fixation pauses are more frequent than is needed for clear seeing of the stretches read, as is shown by the fact that they remain the same in number when the print is removed to a double distance from the eye. Moreover, the work of Dockeray (1900) has shown that the span of clear vision with 10 point type at 35 cm. distance is 20 to 22 mm. on either side of the fixation point, or a matter of an inch and a half in all, a distance much longer than the forward eye movement.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

11. As might be expected from the above statement, it is possible to be at least vaguely conscious, while reading one line, of the material lying in the succeeding lines.

12. There appears to be a tendency for eye movements to fall into rhythms, as shown for instance by the reading of six successive lines with four fixations each. Dearborn lays much stress on this point and believes that "these short lived motor habits" are formed more easily by fast readers, more readily when the lines are short and when their length is uniform and the margins are not too broken. When these rhythmic movements appear, they usually involve also a special manner of distributing time to the pauses, viz., a comparatively long initial pause, followed by two or more short ones of decreasing length and concluded by a somewhat longer pause near the right end of the line.

13 Dearborn recorded the eye movements of three children about ten years of age and declared that the chief difficulties of eye movement seem to have been conquered at that age. However, others claim that children make many more and longer fixations than adults, accompanied by decided uncertainty of movement—re-fixations, over-shooting of the line and the like.

14. The ultimate decision as to the optimum length of line depends on numerous factors of which eye movement is but one. When the line is shortened, pauses seem to be decreased in duration even though they sometimes increase in frequency. Again, short lines develop or favour the development of habits of rhythmic eye movement. Once more the material seen vaguely in lines below that read is more closely connected with the material in attention when the lines are short than when they are long. Huey favours a line of about 600 mm. length and Dearborn, a line of 75 to 85 mm., or about one-third longer than the ordinary newspaper line. In this matter most primers and readers are again "grievous sinners," for their lines are often longer than those of ordinary books, often reaching 120 mm. or more.

15. Fatigue causes a slower rate of reading and a gradual decrease in the velocity of eye movements.

16. Problems of speed may be approached by comparing the performances of fast and slow readers. Tests show that an individual who reads a given style of material rapidly will read any material at a relatively rapid rate, so that more speed is rather a function of the personal equation than of the kind of material read. Actual differences are, however, even in persons of like occupation, rather extreme; thus, of thirty persons all interested in university work the slowest read 3.4 and the fastest, 11.5 words per second in Robinson Crusoe. Fast readers evidently drop more readily into rhythmic eye movement and make fewer and shorter stops.

A New Instrument!

"An ingenious little instrument by means of which anyone can see the back of his eyeball was shown on the 6th inst. to a 'Daily Mail' reporter by the inventor, a West End physician. 'It will now be possible,' he said, 'for any doctor to examine the fundus (back) of his patient's eyes in daylight. This is of great importance in diagnosing many diseases. For instance, the first signs of diabetes may appear in the eyes, and tumours on the brain may be revealed by a little bleeding in the fundus. Syphilis and other diseases may be diagnosed in the same way.' The instrument consists of a small lens attached at a suitable angle to a cylindrical torch, light being obtained from a small portable battery."

An announcement that appears elsewhere in this issue draws attention to the forms of spectacle lenses in connexion with the question of inflexions into the eye of the wearer. For those interested to pursue the mathematical investigation of this matter, it should be recalled that formulæ were given in the fourth article of Mr. Swaine's series on "Geometrical Ophthalmic Optics."

The Technical day courses of lectures and laboratory work for ophthalmic opticians, scientific and optical instrument manufacturers, will commence at Northampton Polytechnic Institute, Clerkenwell, on Monday, the 3rd prox. Entrance examinations will be held on the 27th and 28th insts. For the evening technical courses this session commences Monday, 26th inst., with enrolments during the previous week. Detailed particulars can be had by application to the Principal, Dr. R. Mullineux Walmsley, F.R.S.E.

New Company.

C. Winston & Co., Ltd.—Private Company. Capital £500 in £1 shares. To carry on the business of opticians, manufacturers, importers and exporters of and dealers in optical, mathematical, philosophical and scientific instruments, photographic apparatus and requisites, jewellers, etc. The first directors are: Herman Cahal, 53, Herbert Street, Cheetham, Manchester, and Mrs. Mary Winston. Qualification £150. Secretary: C. Winston. Registered Office: 367, Bury New Road, Higher Broughton, Salford.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Spectacles
R'less Spects.
R'less Mounts
Monocles

Manufacturer of **GOLD** in 9ct, 12ct, 15ct.

Astigs
Folders
Rigid Clips
Odd Mounts

Special Frames.

Stock Orders.

GOLD REPAIRS AND JOBBING.

FRANK BUTTERWORTH, *(Estab. 1898)*
4, TENBY STREET NORTH, BIRMINGHAM.

Canadian **FUSED BIFOCAL LENSES** in either finished, semi-finished or rough are the **FINEST MADE** barring none, and they can be had for very **MUCH LESS.** It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,
DANDURAND BLDG., MONTREAL.
Cable "Optical" A.B.C. Code 5th. Edition.

ARE YOU PUSHING

Chance's A2 Crookes?

We are. It is increasing our sales and bringing new customers.

Let us send *you* samples.

Show it to *your* clients.

Increase *your* sales.

Send for the W.O.W. price list.

Willesden Optical Works, Ltd.

Lens Factory:
Dudden Hill Lane, N.W.10

Sir William Crookes' Ultimate Glass was, as the name implies, his very last effort—the ultimate result of his many years work. Crookes A and B were Sir William's early attempts, with which however he was by no means satisfied. Crookes A and B are certainly Crookes; but the latest form of Crookes Glass is that which is under the absolute control of Sir Wm. Crookes Anti-Glare Glass Co., Ltd.

F. BARKER & SON, LTD.
SUNDIAL HOUSE,
12, Clerkenwell Road, LONDON, E.C. 1

Registered Trade Mark Estab. 1848

MANUFACTURERS OF ALL CLASSES OF
SCIENTIFIC AND OPTICAL GOODS.

MANUFACTURERS OF
Aneroid Barometers, Compasses, Drawing, Mining, Surveying & Scientific Instruments of Every Description.

Illustrated and Descriptive Catalogue Post Free to any part of the World. Illustrated Booklet upon Sundials, Barometers and Compasses, Post Free. LISTS FREE.

Correspondence Invited. Bankers' and Trade References.

CLINICAL THERMOMETERS A SPECIALITY

FINEST
ROUGH CYLINDER BLANKS,

Also good 2nd Selection
A very attractive proposition for Export and cheaper work.

CHANCE'S GLASS USED.

ACTUAL MANUFACTURERS
ASSOCIATED OPTICAL WORKS, Ld
5, Queen's Buildings, London, W.1
Near Tottenham Court Road.
No Connection with any other Firm. Telephone: Museum 2216.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

LIQUIDATION. Large number of spherical tools and cylindrical tools for M22 machine for sale. Any reasonable offer to Messrs. Dutton, Armstrong & Co., Clarence Chambers, 4, Piccadilly, Manchester.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.— Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

PARTNERSHIP wanted in sound optical business Western district. 13 years' West End experience. Reply, W.V.W., 122, Manor Road, N.16.

OPTICAL businesses wanted in Lancashire towns. Particulars of any business for disposal to Box 3473, c/o "The Optician," 125, Fleet Street, E.C.4.

SIGHT-TESTING Business wanted. Trade immaterial, if position good. Write, H. Bevan, 8b, Richmond Parade, East Twickenham.

Employment Bureau. *Concluded from page 1*

YOUTH, age 18, just left school, passed senior Oxford Local Examination, 1920, desires apprenticeship with good class optician. Midlands preferred. Apply, T. J. Boulter, 82, Barbourne Road, Worcester.

SIGHT-TESTING optician, extensive experience, good retinoscopist and salesman, thoroughly practical and reliable, disengaged. Reply, Optician, 40, Hazlewood Avenue, Newcastle-on-Tyne.

TRAVELLER, optical, with connection on South ground seeks engagement. Box 5061, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION required by sight testing assistant (22). Capable and careful refractionist, well experienced. Small repair work. Good salesman. Disengaged. London preferred. Studying November's S.M.C. J., 4, Upper Tulse Hill, S.W.

The Optical Society.

President: Mr. R. S. WHIPPLE, M.I.E.E.
Vice-Presidents: Prof. FREDERIC J. CHESHIRE, C.B.E., Director of the Technical Optics Department of the Imperial College of Science and Technology, South Kensington; Sir HERBERT JACKSON, K.B.E., F.R.S.
Hon. Treasurer: Mr. I. G. AITCHISON, B.A., LL.D.
Hon. Secs.: Mr. L. C. MARTIN, B.Sc., Imperial College of Science and Technology, South Kensington S.W.7 and
Papers' Secretary: Mr. F. F. BRYSON, M.A., B.Sc.

The Society of Chemist-Opticians.

President: Mr. F. S. HORSEY
Vice-Presidents Mr. FOURACRE.
Hon. Secretary: Mr. J. HARCOMBE CUFF, Friern Barnet Rd. New Southgate, N. 11 Telephone Finchley
THE SUPPORT OF ALL CHEMIST-OPTICIANS IS EARNESTLY INVITED.

Midland Optical Society.

President Dr. G. A. SHAKESPEAR, D.Sc., M.A., Acting Professor of Physics, Birmingham University.
Vice-Presidents: W. E. CHARNLEY, Leicester; W. T. COMER, Walsall; H. L. TAYLOR, Birmingham.
Hon. Treasurer: JAMES LUCKING, Birmingham.
Hon. Secretary: JOHN C. ROLSTON, 36, Trafalgar Road, Cape Hill, Smethwick, Birmingham.
Anyone interested in the science of optics and residing Midland is heartily invited to join.

FOR SALE.
1 Gross 1/20 F.P. Mounts, Sanitary Plaquets, Assorted from 412 to 744.
CHEAP. Quotation on application to
J. B. WARD, Optician, GLOSSOP.

PERCY S. DE SAULLES.
Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES.
Micro Cover Glasses. Glass Cells and Cavity Slips, etc.
The Platts, Amblecote, Stourbridge.

OPHTHALMIC AND SCIENTIFIC
MOULDINGS
Supplied in any Curvature and Glass.
CROOKES A SPECIALITY.
REYNOLDS & BAILEY, 15-19, VINE ST., LONDON, E.C.1



OPTICAL BLOCKS
To illustrate all features of Optical Service. Write for lists.
CHEMISTS' DESIGN SERVICE
12 Humberstone Gate, LEICESTER.

C. BAKER 244 HIGH HOLBORN LONDON
Do You Handle Kodaks? The "Metron" Plate Adapters, if stocked, will mean a large Increase of Business.
Estab. 1765 PARTICULARS AND TERMS ON APPLICATION

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
C. C. DYMOND. M.I.Mech.E., F.I.C.P.A
W. P. THOMPSON & CO.,
12, CHURCH STREET, LIVERPOOL.
Chartered Patent Agents.
H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and AERONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
ESTABLISHED 1878 TELEPHONE CITY 419

INDEX TO "THE OPTICIAN."
Volumes 45 to 57.
Price 6d. each. Post free from
"The Optician," 125, Fleet Street, London, E.C. 4

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Telephone **JAMES B. SLY,** Central 10290.
9 & 10, EDWARD ST., WARDOUR ST. LONDON, W. 1

To S.M.C., B.O.A. & I.O.O. DIPLOMA HOLDERS

Oak frames and modelled gold Arms for the diplomas The Arms of the S.M.C., City of London, and devices of the I.O.O., B.O.A. and Ph. Society in water colours, and framed dark oak, with descriptive engraved plate affixed, 27/6 each. Packed and put on rail.



Printed & Embossed Optical Stationery.
Steel Dies for use of Diploma Holders.
Electros of Coat of Arms & Optical Devices.
Engraved Seals, Prescription Forms, Signs, etc.
Price List on application.

Electro No. 12 Price 3/6

Worshipful Company of Spectaclemakers.

Tuition for the Company's Examinations in Optics and Sight Testing at THE SCHOOL OF OPTICS Ltd.

2, GUILFORD PLACE, LONDON, W.C. 1

Particulars on application.

TO CLOCK & WATCH MANUFACTURERS.

Makers of Mathematical, Scientific and Electric Instruments, Gramophone and Telephone Manufacturers, Engineers, etc.

IN LIQUIDATION.

For sale at a low figure in one lot as a going concern, Lease, Valuable Plant and Machinery, Stock-in-trade, Raw Materials, Office Furniture of the VICTORY ALARM CLOCK CO., LTD., 271, Kentish Town Road, N.W. Favourable Lease, excellent premises, unique complete installation of Plant and Machinery, all modern and some of the best Swiss and Continental manufacture, largely automatic. The business was established to compete with foreign imports and everything necessary for standardised and economic mass production, not only of clocks but accurate instruments and similar articles, was installed. The whole compares with the best American and Continental concerns and it probably stands alone in this Kingdom. All in running order. Expert workmen available. Order to view and summarised particulars of Messrs. Moore, Stephens & Co., Chartered Accountants, 2, Gresham Buildings, E.C.2. and Messrs. Dunn, Soman & Coverdale, Auctioneers and Surveyors 11 St. Helen's Place, E.C.3. Telephone: Avenue, 1506.

BRITISH OPTICAL INSTITUTE, LTD.,
(College of Optics).

Complete Training for the Sight-Testing Optician.

In addition to the usual Daily Classes and Correspondence Courses, there will commence shortly a series of Special Evening Classes, for those desirous of preparing themselves for any of the Optical Examinations.

A further series of Weekly Evening Lectures, and Demonstrations, for candidates for the F.B.O.A. Examination, and for post-graduates, has also been arranged.

Vacation Classes.

From July to October a series of Vacation Classes will be held for those who wish to widen their knowledge—not necessarily with a view to sitting for any examination.

The whole work of the Institute is carried out under the supervision of the Principal, assisted by Mr. G. W. Colebrook, F.B.O.A., F.S.M.C., (Master's Prizeman).

For full particulars apply to:—The Principal, Dr. MAX COQUE, B.Sc., Fern Lodge, 20a, Grove Road, Brixton, S.W.9
Telephone: Brixton 677.

The Optician's Handbook.

Price 4s. 0d. Post Free.

An elementary text book required by every student of Optics.

It is an introduction to "The Study of the Refraction of the Eye, its Anomalies and their Estimation and Correction by means of Glasses.

The Hatton Press, Ltd.,

125, Fleet Street, LONDON, E.C.4

THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER

Subscription Form. **123-125, Fleet Street, London, E.C.4., England.**

Send a copy each week of THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER post free for which we enclose .....shillings for.....weeks.

UNITED KINGDOM 17s.
and ABROAD 20s.

Name.....
Business.....
Address.....
.....

A remittance of 17s. (or 20s. Abroad) for 52 issues includes "THE OPTICAL ALMANAC" post free.
Cheques made payable to The Hatton Press Ltd.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

***A*.—Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

QUALIFIED Optician required as manager. Apply, stating age and experience to G. C. Bateman, 5, Chobham Road, Woking.

RAYNER, 9, Vere Street, London, W.1. Vacancies. Dispensing only. Junior assistant for Liverpool branch. Junior assistant for Leamington branch. Senior assistant (able to take charge) Yorkshire branch. Write, giving full particulars of experience, salary, etc.

WANTED, two competent refractionists used to management. Apply Heaton Caffin, 23, Chapel Street, Edgware Road, N.W.1.

WANTED, optical traveller to advance sales of well-established ophthalmic specialities. Salary and liberal commission to suitable applicant. Applications will be treated with the strictest confidence. Apply, Box 5000, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Lady seeks position in retail optician's. Thoroughly experienced in all prescription work, checking, measuring, fitting, adjusting, knowledge of glazing, drilling and rimless fitting. Several years' West End experience. London, provinces, or would consider offer abroad. Box 5659, c/o "The Optician," 125, Fleet Street, E.C.4.

LADY Refractionist, qualified, requires post, fully experienced. North preferable. Box 5058, c/o "The Optician," 125, Fleet Street, E.C.4.

PARALLEL Plate, prism and lens surfacer requires situation, 7 years' first-class experience. Sparke, 40, Manbey Grove, Stratford, E.15.

F.S.M.C. first-class salesman, until recently manager of one of the largest retail shops in London, is open to accept appointment in a business that is capable of increase and would be willing to receive remuneration by results, or would consider investment of £500 to £1,000. Partnership or otherwise. Write, H. Bevan, F.S.M.C., 8b, Richmond Parade, East Twickenham.

POSITION required by young man, 28, as manager or first assistant. 10 years' experience. Good salesman. Capable in all cases of refraction, both S. & O. Apply, Box 5666, c/o "The Optician," 125, Fleet Street, E.C.4.

WATCHMAKER-OPTICIAN. A provincial firm of jewellers have a vacancy for a good all-round man as assistant manager, must be reliable watchmaker and efficient tester, progressive position. State age, wages required to Box 5665, c/o "The Optician," 125, Fleet Street, E.C.4.

ALL-ROUND jobber required, gold and steel. Particulars to Box 5664 c/o "The Optician," 125, Fleet Street, E.C.4.

SCIENTIFIC and Mechanical engineer requires situation, home or abroad. Thoroughly experienced in all optical instruments and machines. Capable draughtsman designer. Box 5662, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, work for small engineering and drawing office concern. Optical instruments and machines a speciality. Box 5663, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED optician with expert knowledge of general optical instruments and microscopes desires post as manager. Box 5655, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED assistant wishes appointment. Midlands preferred. Box 5657, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, age 18, seeks situation. Edging, rimless fitting and all Rx work. Attend customers, etc., Apply, J.G., 52, Battersea Park Road, S.W.11.

WANTED position as traveller. Two years' experience of trade. Ex references from present employers. Box 5650, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, 21, desires situation with good class optician. Capable refractionist and salesman. Repairs. Knowledge of photography. Permanency desired. Good references. Box 5649, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Man partly qualified, knowledge of sight-testing, desires position with sight-testing optician. Apply, "A.W.," 15, Berkeley Road, Tunbridge Wells.

YOUNG Man, 22, requires position with ophthalmic optician, South Wales, or West of England preferred. 1 year's experience as an assistant, willing to start with small salary. Box 5653, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Lady for optical workshop, experienced in neutralising, bevel and rimless edging and fitting. State experience and salary required to Box 5652, c/o "The Optician," 125, Fleet Street, E.C.4.

GENTLEMAN with sound connection with retail and wholesale opticians in the East and Far East, shortly proceeding on tour, will be pleased to hear from manufacturers wishing to place their line of goods in the Eastern market. Box 5654, c/o "The Optician," 125, Fleet Street, E.C.4.

SIGHT-TESTING Optician, thoroughly competent and reliable, good retinoscopist and salesman. Age 40. Tall, pleasant manner, seeks engagement. Box 5645, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. D.B.O.A., seeks London engagement, 6 years' workshop and consulting room experience. Accustomed to checking and general supervision. Apply, "Toric," 59, Eden Street, Kingston-on-Thames.

REFRACTIONIST, 33, tall, smart appearance, with long sight-testing and practical experience (London and Provincial) requires situation as branch manager or assistant, excellent references. West of England or South Wales preferred. "Trolos," 22, Toronto Road, Horfield, Bristol.

FIRST-CLASS Rimless fitter seeks situation, edging and bifocal worker. Age 21. Wholesale and retail experience. London or suburbs preferred. Box 5647, c/o "The Optician," 125, Fleet Street, E.C.4.

GLAZIER (Male), requires job or would be useful at shell work, etc. Apply, P., 20, Compton Buildings, Goswell Road, E.C.1.

FIRST ASSISTANT (24), 9 years' experience wholesale and retail, requires situation with good class firm. Smart salesman, reliable tester, and conscientious worker. Used to taking full charge. Wide experience in oculists' prescriptions. Would consider good wholesale position London or suburbs preferred. Excellent references. Disengaged Sept. 30th, 21. Box 5648, c/o "The Optician," 125, Fleet Street, E.C.4.

LADY **Optician requires post. 5½ years' experience** sight-testing. Retinoscopy, etc. Can take full charge. Box 5646, c/o "The Optician," 125, Fleet Street, E.C.4.

JUNIOR (D.B.O.A.) seeks position in good house (Liverpool or district preferred). Good refractionist, all repairs, mounting and soldering. Smart address. 5 years' experience. Disengaged early October. Box 5651, c/o "The Optician," 125, Fleet Street, E.C.4.

ADVERTISER, 36, requires permanency, 12 years' experience Optical Instrument trade, spectroscopic and experimental work, chemistry, etc. Moderate salary for good opportunity. Box 5656, c/o "The Optician," 125, Fleet Street, E.C.4.

Concluded on page 2.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE

U.K. TORIC LENSES.

We beg to announce that in future we propose making our FINISHED TORICS Base + 6.0 with MINUS as well as PLUS cylindrical power. That is to say our Base + 6.0 Torics will be worked in two forms.

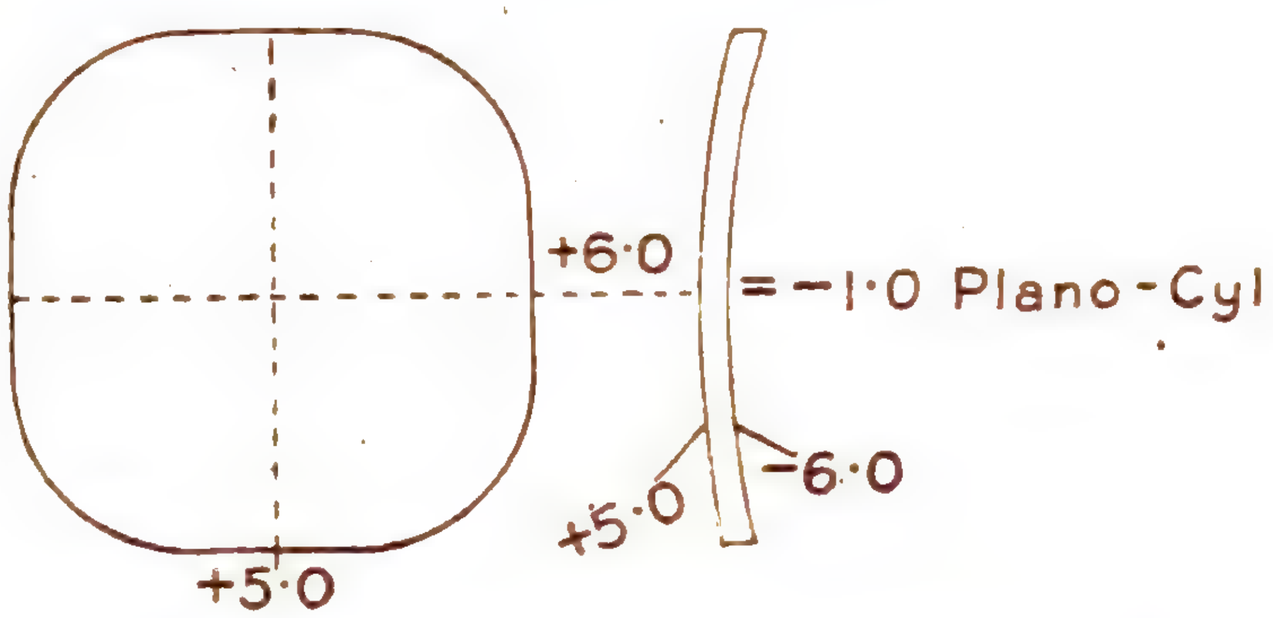
(1) Torics for PLUS combinations will have the Toric surfaces with the curve in one meridian + 6.0 and the curve in the other meridian deeper according to the (+) cylindrical power.

(2) Torics for MINUS combinations will have the Toric surfaces with the curve in one meridian + 6.0 and the curve in the other meridian shallower according to the (−) cylindrical power.

The advantages are that MINUS lenses will not require to be surfaced on excessively deep concave tools and the axis of the cylinder remains constant with the + 6.0 Base curve.

All Plano-Cylinders whether Plus or Minus will be worked with a − 6.0 spherical surface.

The diagram illustrates the 2nd form and it will be seen that by adding the spherical power required to − 6.0 the correct surfacing tool is given without having to transpose the cylinder.



Convex Toric Blanks can be supplied in either of these forms but unless specifically ordered the + 6.0 and deeper curve will be supplied.

Whilst making this announcement we beg to state that our Concave Torics are only made with − 6.0 Base curve and deeper, until the Cylindrical Power exceeds − 4.0 when we make the Base Curve − 4.0.

A selection from these Toric blanks will permit most Rx to be produced with the best appearance and effect.

UNITED KINGDOM OPTICAL CO., LTD.,

(Wholesale and Export Only.)

MILL HILL, LONDON, N.W.7

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE OPTICIAN
Reg. at G.P.O. as a Newspaper

AMERICAN OPTICAL COMPANY, LIMITED

A Case of Color



Wellsworth Imitation Leather Cases

Supplied in MG Covering in Three Colours.

Green Blue Wine

At the Same Price as Black MG Cases

Three beautiful colors to pick from. In addition to the usual Black MG covering on Wellsworth Imitation leather Cases, you can secure either Green, Blue or Wine Cases, or an assortment of four colors, and at the same price as charged for plain black MG cases.

Wellsworth Imitation Leather Cases have tight, snug-fitting covers that keep the dust out. Patented self-closing positive action spring is inconspicuous and noiseless. Heavy gauge steel cover strengthens case and means added lens protection. Covering and lining vulcanized to metal prevents rusting, finished with smooth fitting, high grade, fast color velvet and selected chamois. Properly covered edges wear well and long.

Ask your jobber for Wellsworth Colored Imitation Cases.

WELLSWORTH

TRADE (A) MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No 39 Hatton Garden, E.C., LONDON

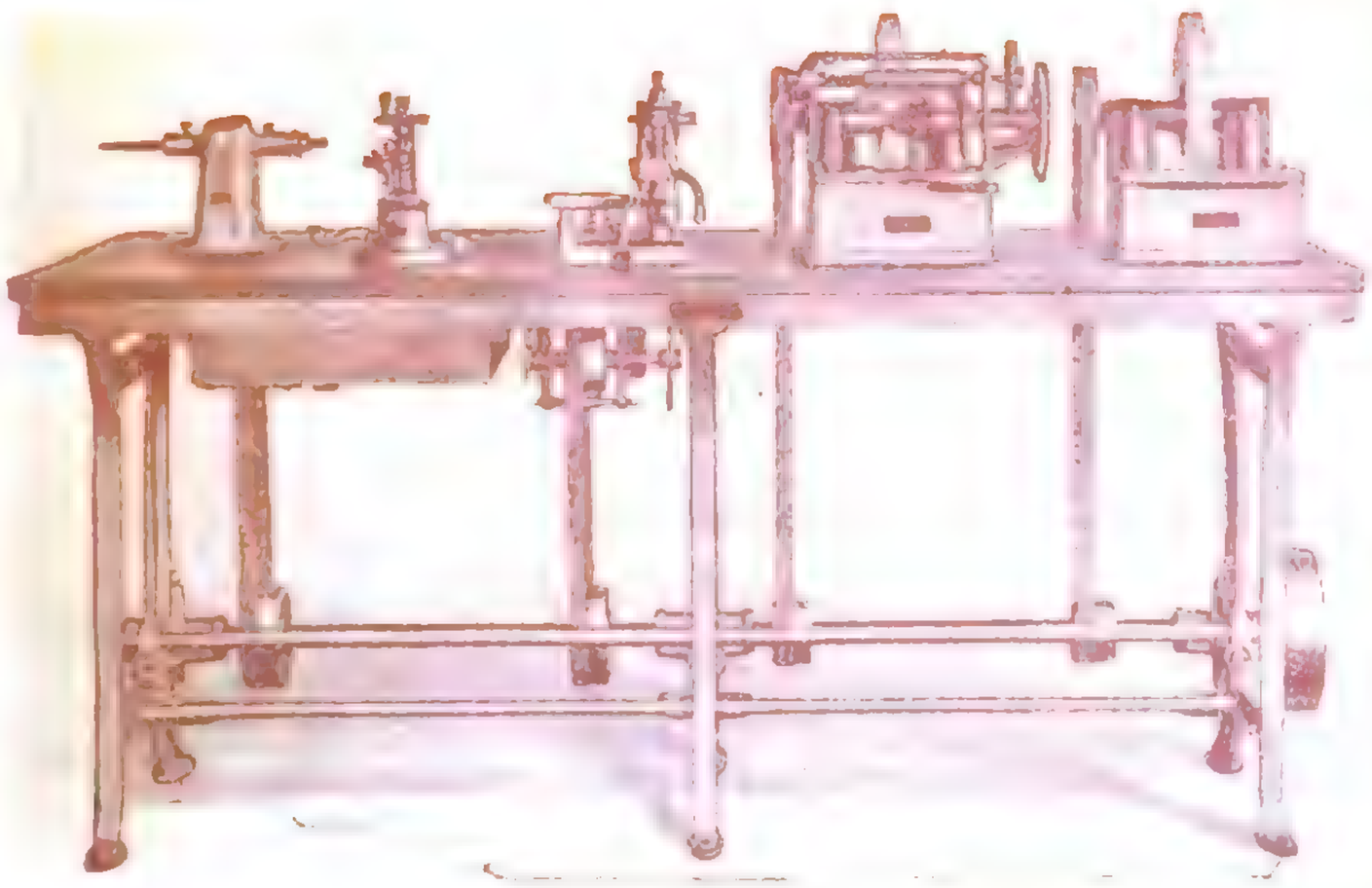
Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C. 4. (Printed by The Century Press, Fulham.) Sep. 16, 1921

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The OPTICIAN
And SCIENTIFIC INSTRUMENT·MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1591 FRIDAY, SEPT. 23, 1921.



Immediate delivery can be made from stock of above Machines without benches.

M 75—AUTOMATIC EDGING MACHINE

M 83—HAND EDGING MACHINE

M 91—LENS DRILLING MACHINE

M 51—LENS CUTTING MACHINE

M 131—POLISHING and BUFFING HEAD

—o—

Write to your Wholesale House who will be pleased to give you all particulars of the above lines.

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

AMERICAN OPTICAL COMPANY, LIMITED,

39, Hatton Garden, LONDON, E.C.1

Reg'd at the G.P.O. as a newspaper **PRICE 4d** *Subscription post free 12 months 17s*

Postage in United Kingdom 1d

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Foreign Subscription including "Optical Almanac" post free 20s. yearly. The Hatton Press, Ltd., 154-5, Fleet St., London, E.C.4.

GEORGE CULVER LTD

Manufacturing Opticians,

JOBBING AND PRESCRIPTION WORK

ACCURACY,
NEATNESS,
PROMPTNESS

Large and full stocks of English made Lenses of all combinations. Orders can be executed promptly.

OPTICAL WORKS:
WHITE LION STREET,
PENTONVILLE,
LONDON, N. 1

TELEPHONE:
NORTH 369 and 871

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

"Stork"

Automatic Eyeglass

BRITISH MADE.

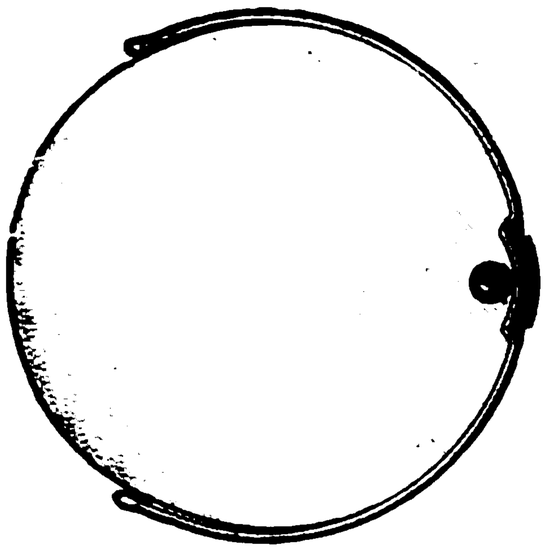
Holder

PAT. APPD. FOR

Constructed on an Entirely New Principle, this chain is Mechanically Perfect.

It embodies all the essentials of the reliable eyeglass holder and is a chain that can be recommended with confidence.

Strongly made yet neat and well-finished. Action combining simplicity with Certainty. Locking Bolt makes accidental recoil of chain impossible. British Made and reasonable in price. Chain can be worn at any length.



The "COURT" Invisible Gallery Oxford.

Adaptable to any Size or Shape of Eye.
Made in 9ct. Gold.

Rd. No. 682819.

Samples and prices sent on application to

WALTER H. THOMPSON,

: 66, HATTON GARDEN, E.C. 1 :

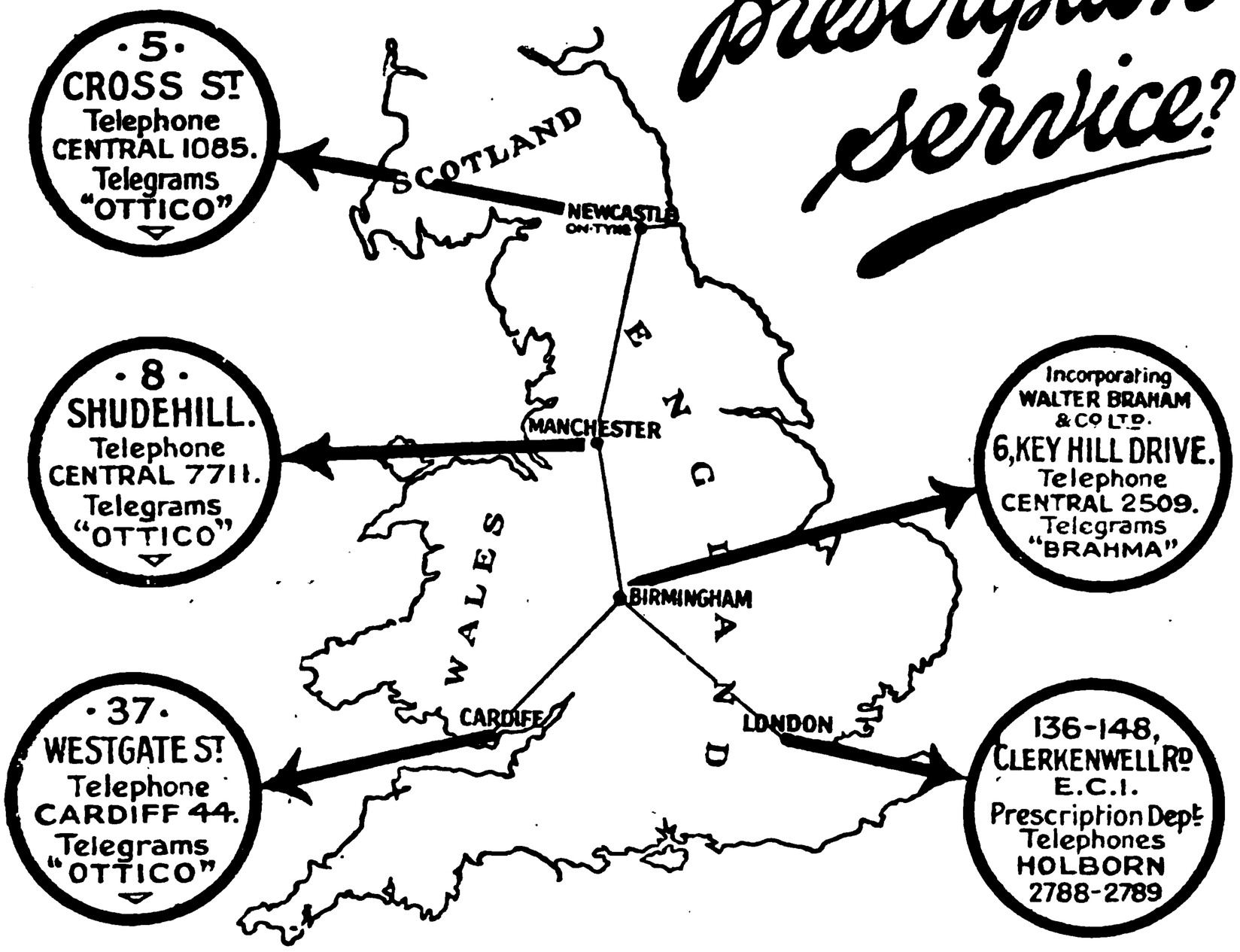
Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713 (Two Lines).

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

J&R.F.LTD

Why not link yourself with our prescription service?



Each Branch has a Complete Prescription Equipment.

LINK QUALITY SERVICE BRAND
Regd Trade Mark.

J & R. Fleming Limited.

136-148. Clerkenwell Road, LONDON, E.C.1.

Telegrams: "OTTICO" SMITH, LONDON.

J&R.F.LTD

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
Col. & Ald. Sir CHARLES C. WAKEFIELD, Bt., C.B.E.

Upper Warden
The Rt. Hon. VISCOUNT HILL.

Renter Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Director of Examinations
The Rt. Hon. Sir WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS

of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., on Oct. 31st, 1921, and during the first week in November.

Last date for Entries, Sept. 30th.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,591

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, SEP. 23, 1921.

The Protection of Industries.—The letter we publish this week from Mr. North, who as a manufacturer of thermometers knows his subject, draws attention to a direction in which the provisions of the Safeguarding of Industries Act will have to be considerably amplified, if the whole of the professed purpose of this legislation is to be anything like fully achieved. We remember when, ten or fifteen years ago, British optical manufacturers used to say that a 10 p.c. import duty upon manufactured goods was all they needed, so as to insure the success in world competition of this British industry. No doubt that statement was right at the time, as it was made by those in the best position to know the facts and their implications. Now by the world revolution in currency exchanges, the whole basis of such argument is changed. While it is not our function here to enter upon any political discussion about the conflict of banking and mercantile and manufacturing interests—that has been referred to from time to time in our correspondence columns—we have no hesitation in expressing agreement with Mr. North, that if the Government's intention to protect key industries is an honest one, it might well be ex-

Digitized by Google Original from THE OHIO STATE UNIVERSITY

pressed in more adequate measure by some extension of what must, no doubt, be called the "good beginning" made by the new Act.

* * *

Trade Boards.—Some considerable controversy is proceeding in the public Press on the subject of the activities of our sixty-one "Trade Boards." The cost of administration is stated to be something appreciably over £100,000 a year. Complaints are made as to vexatious interference, stirring up to activity rather than tending to compose disputes on wages between employers and employees. A reminder is given by Mr. T. E. Jackson, Secretary of the Incorporated Association of Retail Distributors, that in 1919 an industrial conference convened and addressed by the Prime Minister, recommended unanimously the adoption of a "national minimum wage," to suit the varied subsistence requirements of male and female adults and young persons. No one can be found to argue upon any public grounds, for the continuance of the sporadic evil of "starvation" wages; but when once a tolerable minimum had been imposed by law, to avoid cases of gross hardship, it would be far better to leave the remuneration of the various higher "grades" of labour to be settled by collective or other bargaining between masters and men.

* * *

Some Uses of Rubber.—The publication recently in these columns of a note on the present low price of rubber (mentioned with reference to uses of that material for scientific instrument making) has brought an intimation that some among the members of the Rubber Growers Association are most anxious to encourage every possible extension of the commercial applications of their product. What form such encouragement is to take does not appear; nor in the absence of a public announcement by responsible parties, need it be considered. And in any case, as regards any influence on the price of ordinary grades of rubber, the demand for instrument making purposes is of an order of but little importance. Because of its impermeability to water, and fine insulating properties, the chief instrumental adaptations of rubber and ebonite are in connection with electrical work. Electrical instrument making merges in one direction into electrical engineering, and in another into the still wider domain of the various "wiring" industries, for telegraphs, telephones and so on. These utilise great quantities of rubber. So with the tubing and other containers by which, mainly, glassware is supplemented in the chemical laboratory. The equipment of a laboratory is not so very different except in scale from that of a chemical works; and there is a big field for intelligent adaptation of rubber products in chemical engineering. Metallurgy again, in every department, from glass making to iron founding, is in close relation with the instrument makers' business—not only like all other applied science in every kind of factory, because so many measuring and testing instruments are called for; but also more intimately because, on a small scale, so many processes of the foundry are duplicated in the factories and workshops of opticians.

* * *

A Rubberised Fabric.—Developments in the commercial employment of oxygen and acetylene gases have helped much in this direction; and now even small steel castings can be made by instrument makers for their own needs with but little special plant, when that is desirable. An acquaintance with the simpler principles of metallurgy, is of value even to a repairer when soldering or electric-welding parts of a spectacle frame. Where the current is available, it has been found that electric welding gives a very neat repair of a broken steel side. As for compressed oxygen gas, the popular view until just lately has practically limited its use to purposes connected with optical projection. Now that aeronautics looms so largely in the public eye, its employment for respiration at high altitudes is being familiarised. But this by no means exhausts the restorative uses of the gas in a medical aspect. Compressed oxygen should become an article in good demand, regularly stocked for sale in pharmacies and instrument dealers' shops. The prejudice that has been caused against steel cylinders, because of occasional accidents, could be removed by an intelligently directed advertising campaign to enlighten the public on the facts.

* * *

Returning to the subject indicated by the title of these notes, we may recall that at the time of the Bradford explosion nearly 28 years ago, a suggestion was published in these columns that a very durable and safe compressed oxygen gas holder could be built like a cocoon of strong fibre impregnated with rubber. The fabric, including a metal valve of course, might be woven of about the size of a football. That idea, while perhaps practicable enough, is however only a concession to prejudice as already mentioned.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

A Rubber Hygroscope.—In the narrower sphere, restricted to optical and meteorological instruments, the use of rubber excepting as ebonite is almost negligibly small. There is power storage by elastic bands and so on, used in philosophical toys; there is the photographic squeegee and exposure "bulb"; there is now made a rubber sheet (non-porous) which is as light as cork and would serve admirably for an intermediate lining in cases for delicate instruments; and a few other minor practical uses may occur to the reader, together with some fantastic ones. As an instance of the latter, we have had the suggestion of "pneumatic tyre" spectacle rims. By cementing a strip of rubber which is non-absorptive, to a like strip of some other flexible material absorptive of water, we obtain a compound strip that curls according to the hygrometric state of the air—a simple hygroscope. But apart from the trifling nature of its uses, rubber has this in common with most raw materials of instrument making, that its price as raw material is insignificant by comparison with the price of the manufactured article. And that is of course one of the main reasons why our German rivals are able to exploit their situation to such advantage.

The Safeguarding of Industries Act.

APPLICATION OF KEY INDUSTRIES DUTY.

Keen interest has been expressed in respect to the lists of articles which were to be issued by the Board of Trade defining those goods which are to be held to fall under the Schedule in the Key Industries Act. The Act was published in full in our issue of the 9th inst.

These lists, referring to Section (5) of the Act were made available to the public early in the present week; and those which are of direct interest to our readers are printed below. (The only matters omitted here are the lists of certain inorganic and synthetic organic chemicals). Schedule classes are printed in black type, and followed by details of those items to be included under them as at present proposed:—

Optical Glass and Optical Elements, Whether Finished or Not.

Analysers. Fresnel Bi-prisms. Diffraction gratings. Etalon (sic) gratings. Fresnel rhombs. Optical glass (pot or rough); sheet; moulded; flats; discs; plates; moulded or pressed blanks; and other partly worked. Graticules, and worked glass diaphragms. Lenses, photographic (unmounted); projection (unmounted); spectacle (mounted or unmounted); condenser (unmounted); other unmounted worked elements; lighthouse, worked; for gas buoys, worked; for ships' lights, worked; dioptric, worked; and prisms of fluorspar, rocksalt or quartz. Optical light filters. Magnifiers. Mirrors optically worked; Fresnel; Mangin. Objectives, of all kinds. Oculars, of all kinds. Optical Squares. Parabolic reflectors, worked. Polarizers. Prisms, and other like worked optical elements. Prisms, double image. Proof plates. Quarter wave-plates. Quartz wedges, plates, lenses, and prisms.

Optical Instruments.

Abney levels. Alidades. Altazimuths. Amblyoscopes. Apertometers. Astrophotometers. Auriscopes. Binoculars, galilean. Binoculars, prismatic. Bubbles (for levels, &c.). Cameras, astronomical and photographic. Cameræ lucidæ. Cameræ obscuræ. Cathetometers. Cinematographs. Circumferentors. Clinometers. (optical). Cœlostats. Collimators. Calorimeters (optical). Comparators (stereo). Compasses, prismatic. Condensers, optical in mounts. Cystoscopes. Cyclophotometers. Dermatoscopes. Dichroiscopes. Diffraction apparatus. Dipoidoscopes. Directors (optical). Dynameters. Dynamometers (optical). Echelon gratings. Epidiascopes. Etalon gratings. Extensometers. Eye glasses (engravers', watchmakers', etc.). Eyepieces, diagonal, compensating, Gauss, Kellner, projection, Ramsden, Huygenian, magnifying and other optical. Field glasses. Focometers. Goniometers. Gun sights optical. Glasses, engravers', watchmakers', &c. Gradiometers. Graphoscopes. Heliographs Heliometers. Heliostats. Horizons, artificial. Height measuring instruments, optical. Interferometers. Keratometers. Lanterns, optical. Laryngoscopes. Lecture and experimental apparatus, optical. Lenses, optically worked (mounted). Levels, Abney; dumpy; drainage; reflecting; pocket, telescopic, "Y", bubble (plain tube and mirror type). Linen testers. Magnifiers. Mekometers. Meldometers. Mica Wave-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

plates. Microscopes, with or without lenses. Microscope eyepieces, condensers, erectors, oculars, objectives, and detachable mechanical stages. Micrometer microscopes. Micro-spectroscopes. Micrometers (position readers). Miner's dials. Monoculars. Nephoscopes. Nicol prisms (mounted). Opera glasses. Ophthalmoscopes. Ophthalmometroscopes. Ophthalmometers. Orthoscopes. Optical benches. Objectives, microscope, photographic, telescope, and all other types. Perimeters. Periscopes. Phorometers. Photographic cameras, with or without lenses, finders, objectives. Photo-heliographs. Photo-micrographic apparatus. Photometers, optical. Photometer heads. Polariscopes. Polarimeters. Pyrometers (optical). Prismatic apparatus, oculists'. Quadrants. Range-finders. Reading glasses. Refractometers. Retinoscopes. Rifle sights, optical. Rhinoscopes. Saccharimeters. Sextants and box sextants. Siderostats. Sights, optical. Sight-testing apparatus. Skiascopes. Spectacles (lenses only). Spectrometers. Spectrographs. Spectroscopes. Spectro-polarimeters. Speculums. Spherometer, optical. Spinthariscopes. Stereometers. Stereoscopes. Sunshine recorders. Tacheometers. Telemeters. Telescopes. Telescope eye-pieces, objectives, and erectors. Theatre glasses. Theodolites. Tintometers optical. Transit instruments. Trial cases, oculists' and trial sets, oculists'. Viewfinders. Zenometers.

Scientific Glassware.

Absorption apparatus. Absorption bulbs. Absorption towers. Adapters. Air pump receivers. Aspirators. Ampoules. Albumenimeters. Albumenometers. Alkalimeters Arsenic testing apparatus. Ammoniometers. Alcoholometers. Argentometers. Acidometers. Basins, crystallising, and evaporating. Barometers, mercury, in glass. Barkometers. Brinometers. Beakers. Boats, weighing, and combustion, silica ware. Bottles, culture, weighing, dropping, specimen, serum, Woulff's specific gravity, reagent, washing, gas generating, gas exploding, gas washing, aspirator, ether, canada balsam, and with ground-in pipette. Bulbs, nitrogen, absorption, gas sampling, vaccine, vapour density, potash, specific gravity, and condensation. Burettes, and gas burettes. Butyrometers. Butter, Wollney's apparatus for determination of volatile fatty acids. Butter, Polenske's apparatus for cocoanut oil. Cones, cordite. Cylinders, measuring and hydrometer. Calcimeters. Calorimeters. Colorimeters. CO_2 apparatus. Condensers. Cremometers. Chromometers (Stead's). Crucibles (silica). Combustion boats (silica ware). Desiccators. Dishes, crystallising and Petri. Distillation apparatus (laboratory). Dilators. Dialysers. Eudiometers. Eyes, artificial human. Electrolysis tubes. Filtering apparatus (laboratory). Filter holders. Fat extraction apparatus (laboratory). Fractionating apparatus. Funnels, separating, thistle and filtering. Flasks, yeast, measuring, distilling, culture filtering, fractionating, stoppered, extraction, conical, serum, beaker, cement, (specific gravity) fractional distillation, gas generating, Ledebur's, Corfell's, specific gravity, gas washing, and Rufflers. Glasses, Nessler's, sediment and test. Gas regulators (laboratory), gas holders (laboratory). Gas analysis apparatus. Gas calorimeters, receivers, drying apparatus, regulators (laboratory), volumeters (laboratory), aspirators, and washing apparatus (laboratory). Hæmocytometers. Hydrometers. Hydrometer jars. Hempel's apparatus. Hoffman's apparatus. Jars, bell. Jars, for Bruhl's apparatus, dressing, gas, hydrometer, museum, specimen, surgical, deflagrating, lixiviating, and filtering. Kipp's apparatus. Kirkby-Gutzeit apparatus. Kjeldahl's apparatus. Lactometers. Lecture and experimental apparatus. Mercury reservoirs and pipettes. Mortars and pestles. Manometers (laboratory. Measures, cylindrical. Meyer's apparatus. Nitrometers. Oleine tubes (Dr. Muller's). Percolators. Pipettes, absorption. Pumps, air (laboratory), filter and Sprengel's Pyknometers. Potometers. Peizometers. Retorts (laboratory). Receivers, gas. Stopcocks, glass (laboratory). Syringes, glass, hypodermic. Saccharometers. Salinometers. Specific gravity apparatus. Still heads. Splash heads. Syphons, glass. Separators, Thoulet's. Taps, glass (laboratory). Test mixers, graduated. Towers, drying. Thermometers. Tubes, Soxhlet, fractionating, drying, Tubes, culture, diffusion, absorbing, condensing, gas drying, gas measuring, gas sampling, vapour density, absorption, specimen, graduated gas, U.V. and Y., weighing, U. stoppered, calcium chloride, combustion, condensation, Bulloch's, reduction, test, ignition (silica), specific gravity, and arsenic. Tubing, Ureometers. Urinometers. Vapour density apparatus. Vacuum desiccators. Vacuum flasks (laboratory). This does not include the ordinary vacuum flask food containers. Vacuum receivers. Vacuum vessels for liquid gases. Serum vials. Viscosimeters. Water-testing apparatus. X Ray Tubes (all kinds).

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



THE SCHEME

As you may have heard, the local advertising of Chance's "CROOKES" Glass by Opticians is having a great vogue, and is, we understand, resulting in an all-round increase of custom for those who are so advertising. So unflagging have been the requests from Opticians for the blocks that we have offered to supply free, that we have found it worth while to prepare a **special** series of six advertisements for small spaces in local papers. We illustrate them (quarter size) here. Those down the side are 4″ deep by 4½″ (two columns) wide, those at the bottom 4″ deep by 2¼″ (one column) wide. The blocks are complete with illustrations and printed matter as shown, and with a blank space for any extra message you desire to insert. We shall be quite pleased to supply them free to any Optician who sees the possibilities of increased business which lie in

Chance's 'CROOKES' Glass

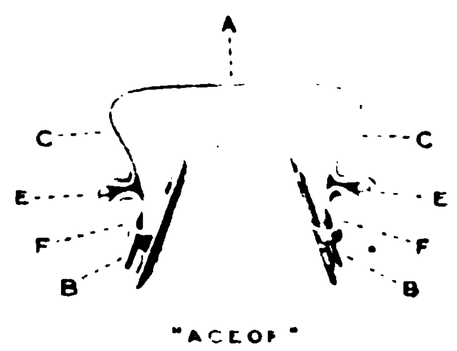
An instrument is now on the market to demonstrate to the public the efficacy of Chance's "CROOKES" Glass in cutting off the harmful light rays.

CHANCE BROS. & Co., Ltd.,
Glass Works,
SMETHWICK, BIRMINGHAM.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Phone:—City 3225 (3 lines) *Telegrams:—Bulford, BARB. London.*

PATENT



MOUNTINGS

"ACEOF" REG

NOTE the bridge A, with its graceful curves terminating at B.B. engaging the periphery of the lenses from C to B with a soft firm springy grip when fastened into position by the screw lugs E.E. Placquets adjustable at F.F. Simplicity is the Ace of its charm.

Made in Gold only—the first order for one dozen being supplied as follows:—Eight empty, and the remaining four made up as a fitting set in a nice case and a pair of plyers for adjusting.

"29 by 41."

The **"Aceof"** Mount lends itself to another important development—namely, what we term the Scientific Optical Size of Lenses—the 29 by 41 size.

The 29 by 41 is an ideal base measurement for a Lens size. Add or deduct as conditions require but maintain the basic shape of 29 by 41. An ideal shape governed by the muscular movement of the human eye.

Made by the firm whose Reputation for Prescription Work is:—*"Second to None."*

NEWBOLD & BULFORD,

Prescription House,
GOSWELL ROAD, LONDON,
E.C.1

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Laboratory Porcelain.

Anærobic boxes and plates. Arsenic plates. Balloon filters. Basins. Baths, air, water, and cover plates therefor. Beakers. Boats, combustion. Burners, atmospheric, Bunsen. Boilers, evaporating. Boiling-point apparatus. Beehive shelves. Blow-pipe jets. Capsules. Centrifuges. Casseroles (laboratory). Crucibles. Crystal drainers. Desiccator plates. Digesters. Dishes, acid, crystallizing, evaporating, for desiccators, perforated (for drying &c.) and staining. Draining-tube racks. Filter baskets, cones, discs, drainers, holders, rings, funnels, and plates. Flasks. Funnels plain and filtration including Buchner's funnels. Jars, assay, distilling, nitrating. Mortars and pestles. Mercury pumps and troughs. Pipette rests. Plates for desiccators, micro slides, sputum, weights. Pots, perforated, for staining tissues and the like; also dye pots. Pyrometer tubes Retorts. Rings. Spatulas. Spoons. Steam jackets. Stills. Strainers. Tubes, combustion pyrometer, furnace, gas leading. Troughs, mercury, staining, combustion, wax embedding. Tiles for arsenic testing and colour comparison. Tables (for desiccators). Trays. Triangles. Water baths and cover plates therefor.

Scientific Instruments.

Ammeters (laboratory and standard). Accelerometers. Astatic dynamometers. Anemometers. Aneroid barometers. Architect's scales. Autoclaves (laboratory). Altimeters. Bridges, permeability, Wheatstone. Balances, analytical assay, chemical and other precision. Barographs. Barometers (mercury). Binnacles. Boiling-point apparatus. Bolometers. Calculating cylinders dials and rules. Calorimeters. Cardiographs. Condensers (laboratory and standard). CO_2 recorders. Clinometers (non-optical). Comparators and other similar measuring devices of precision. Compasses, drawing, beam, proportional, magnetic (not including toys and cheap jewellery). Chronographs barrel. Curves, French, railway, ships', other mathematical drawing. Cross staff heads. Dynamometers electro, laboratory and standard. Drafting machines. Dividing machines and engines, linear and circular. Electrometers. Electrodynometers. Electroscopes. Flash-point determining instruments. Fluxmeters. Frequency recorders. Galvanometers (laboratory and standard). Galvanoscopes (laboratory and standard). Graphoscopes. Gyroscopes, laboratory. Does not include toy gyroscope tops). Hysteresis testers. Hæmacytometers. Hæmoglobinometers. Hygrometers. Hydrometers. Hypsometers. Hygrographs. Heliochronometers. Indicators, engine. Induction coils (laboratory). Incubators (laboratory). Influence machines (electric) and other static machines. Integrators (planimeter type). Iris diaphragms. Isographs. Ice calorimeters. Laboratory furnaces, electrical. Magnetometers. Milliamperemeters (laboratory and standard). Millivoltmeters (laboratory and standard.) Mathematical drawing instruments. Microtomes. Micrometers, for measuring thickness of lenses, plates, paper, &c. Meltrometers. Mining scales. Meters, stream. Ohmmeters. Optometers. Ordnance scale. Oscillographs. Oscilloscopes. Permeameters. Physical lecture and experimental apparatus. Potentiometers. Photometers. Pyrometers (electrical). Pantographs. Planimeters. Protractors. Pumps vacuum (laboratory). Paralleloscopes. Plane tables. Pelorus. Rain gauges. Rules, slide, parallel, calculating. Sclerometers. Scleroscopes. Screens, fluorescent. Seismographs. Set squares. Slide rules. Sounding machines. Station pointers Spectroscope slits. Spherometers. Shutter eyepieces. Statoscopes. Testing sets for electric insulations and conductivity measurements. Thermometers, mercury in steel. Thermometers, metallic resistance. Thermo-couples. Thermographs. Thermostats (laboratory). Thermoregulators. Tide gauges. "T" squares. Viscosimeters. Voltmeters (laboratory and standard). Voltameters. Wattmeters (laboratory and standard). Water tester, Dionic. X-Ray apparatus.

Gauges and Measuring Instruments of Precision of the Types Used in Engineering Machine Shops and Viewing Rooms, Whether For Use in Such Shops or Rooms or Not.

Fixed limit, *i.e.*, "Go" or "Not Go" (whether shop gauges or inspector's gauges, and whether capable of being adjusted and locked or not). External—caliper or snap gauges; ring gauges, plain or cylindrical, screw, taper. Internal—plug, cylindrical, screw, taper, end point gauges and telescoping gauges. Special purpose gauges all types. Standard or Reference Gauges. External—calliper or snap; ring, plain or cylindrical, screw, taper, Internal—plug; cylindrical, screw, taper, end point gauges, standard straight edges, surface plates, block gauges or slip gauges, or reference discs. End measuring rods and cylindrical gauges. Micrometors, micrometer heads, micrometer calipers or "micrometer," *i.e.*, external micrometers,

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

length micrometers, depth micrometers internal or inside micrometers, micrometer measuring machines, and all other kinds. Vernier measuring tools including slide gauges or callipers, depth gauges, height gauges, protractors, gear tooth, and all other types. Dial test indicators and accessories. Needle test indicators and accessories. Scribing blocks of precision or surface gauges. Surface plates, scraped. Thickness gauges or feelers. Precision squares all types. Bevel protractors. Centre squares. Measuring machines. Comparators (dial index, needle index, fluid index and all others).

Clinical Thermometers in Japan.

A new law governing imported clinical thermometers provides, according to an announcement in the 'Japan Chronicle' (Kobe), that:

"(1) Those thermometers which are imported after the 1st January, 1921, must be subjected to the Government test and certificated, before the importer sells or otherwise disposes of them.

"(2) As from 30th September, 1921, the importer is not allowed to deal commercially in thermometers, without a Government licence, whether such goods are certificated by the Government or not.

"(3) The above regulations apply to Hydrometers, House thermometers, Pressure meters, Dairy thermometers, etc.

"For further information inquire at the Bureau of Weights and Measures of the Prefectural Government, or to Mr. Samukawa, manager of the Utsunomiya, Shoten, surgical goods dealers, Osaka, who will give any advice desired. In actual practice it appears that American and British certificates are accepted but the formalities have to be complied with."

Writing in the following issue of the above newspaper, an Osaka firm of importers say:

"In an article headed, Clinical Thermometers, you say with regard to the new regulations: In actual practice it appears that American and British certificates are accepted but the formalities have to be complied with. This is very misleading, as none of the tests of foreign Governments are accepted as valid. We still hold a considerable quantity of British-made thermometers, which bear the stamp of the British Government Laboratory test (N.P.L.) but they are not allowed to be sold until submitted to the Japanese authorities and the Government test obtained. It may surprise the reader to learn that from 10 to 20 per cent. of these thermometers, which bear the stamp of the British Government Laboratory, are rejected in Japan."

The editor of the 'Japan Chronicle' appends the following note:—It appears that we did not allow for the curious spirit of hostility which seems to be invariably shown by Japanese Government inspectors towards surgical or medical instruments manufactured in Great Britain. Apparently it is a concealed form of Protection."

Celluloid Industry Regulations.

The New Safety Product—Celastoid.

The Home Secretary has issued draft Regulation under the provisions of the Factory and Workshop Act, 1901, concerning places in which celluloid, or any article wholly or partly made of celluloid, is manufactured, manipulated, or stored. The Regulations include the following:

Stocks of celluloid shall be kept in a suitable place, outside the workrooms, plainly marked "Celluloid Store." Stocks exceeding one hundredweight shall only be kept in a chamber constructed of fire-resisting materials, in which no open light or fire shall be allowed, and which shall not be used for any purpose other than the storage of celluloid.

The store shall not be situated so as to endanger the means of escape from the factory or workshop or from any part thereof in the event of a fire occurring in the store.

The amount of celluloid in a workroom at any one time shall be kept as small as is practicable without unduly interfering with the work carried on.

Efficient steps shall be taken to prevent celluloid from coming into contact with open lights or fires, or, except to the extent that may be necessary for the processes of the industry, remaining near thereto.

Adequate means for extinguishing fire, having regard to the amount of celluloid present in the room at any one time, shall be kept constantly provided for each workroom and storeroom. Adequate means of escape in case of fire shall be provided.

With reference to the above regulations, the British Cellulose and Chemical Manufacturing Co., Ltd. (8, Waterloo Place, S.W.1.) draw the attention of trade buyers to their "Celastoid," a new safety celluloid which is non-explosive and is mechanically satisfactory in every way.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Seven Styles

now made in

"OCENTRIC"

EYEGLASSES

BRITISH MADE.



A Distinctive Model for Each Individual Taste.

RIMLESS MOUNTS & FRAMES. G.F. & SOLID GOLD.

0 series Short Plaquets Regular pattern
100 „ Normal Plaquets Regular Pattern
200 „ Long Plaquets Regular Pattern
300 „ For Centrally Drilled Lenses
(BENT UP PLAQUET ENDS.)
400 „ For Centrally Drilled Lenses
(CLAMPS ATTACHED BY SHORT BRACKET.)
700 „ For Centrally Drilled Lenses
(SWAN NECK BRACKETS.)
800 „ Regular Pattern with Double Straps

SAMPLES and PRICES WILLINGLY ON APPLICATION.

The British Ocentric Optical Co., Ltd.,

Wholesale and Manufacturing Opticians,

12 & 13, EAGLE STREET, SOUTHAMPTON ROW,

LONDON, W.C. 1

Telegrams—Ocentricco, Westcent, London. *'Phone—Holborn 560*

Cables—Ocentricco, London.

C

Digitized by Google Original from THE OHIO STATE UNIVERSITY

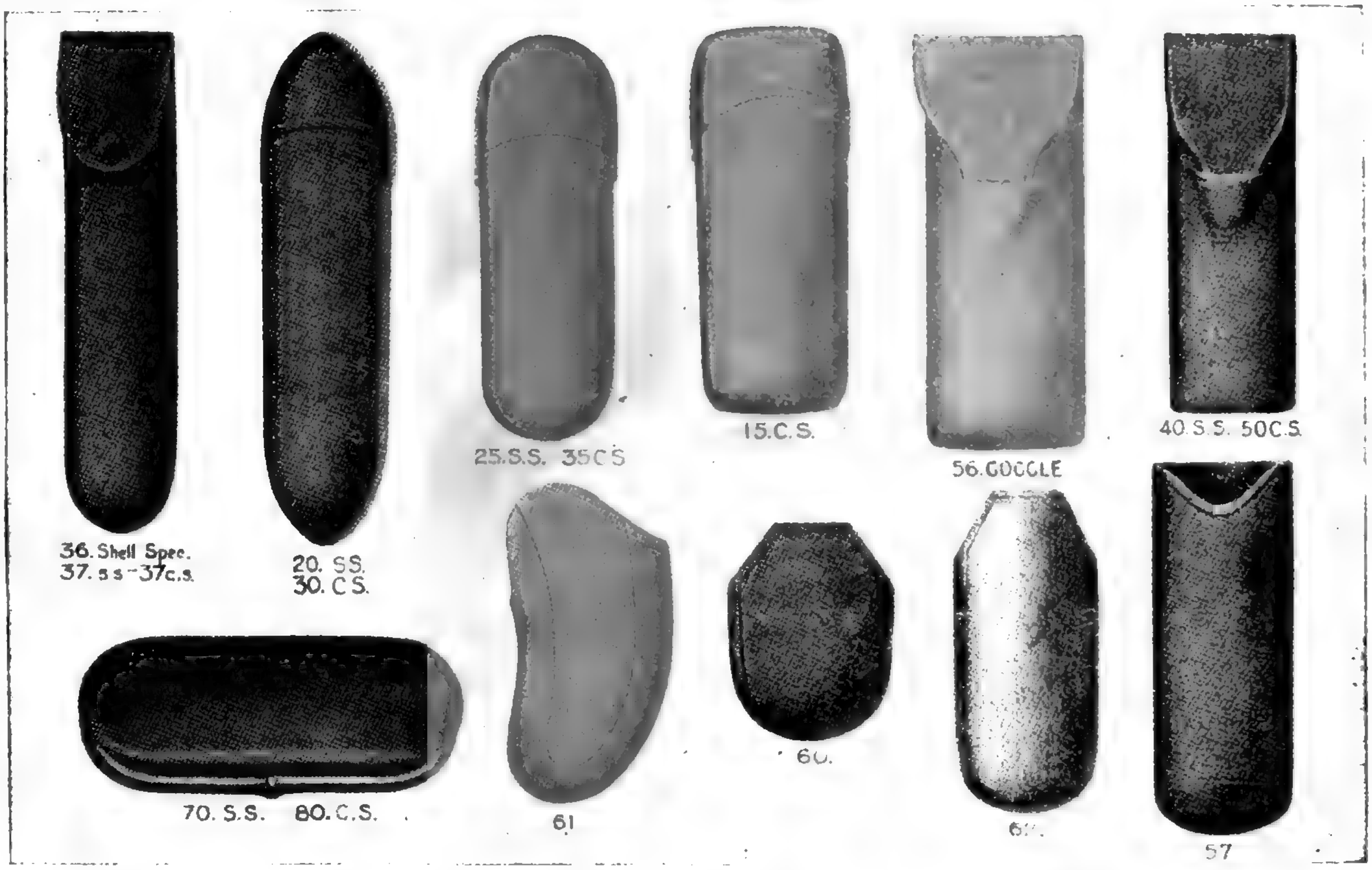
WHOLESALE TRADE ONLY.

W. Smythe & Co. Ltd.

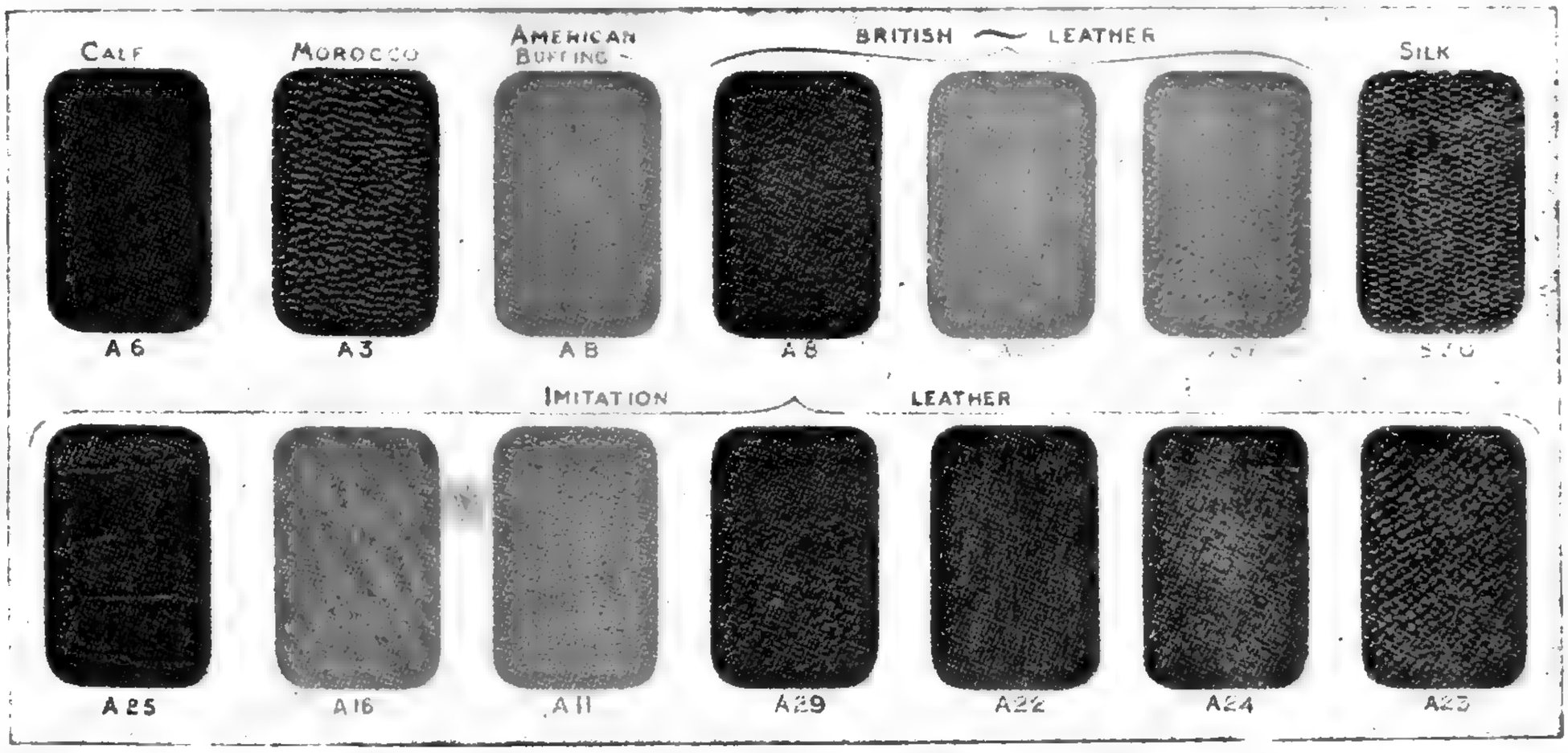
Head Office: 66 and 67, EDWARD ST. PARADE, **Birmingham**

Branch Works—HOCKLEY AND WALSALL.

Patent Optical Case Manufacturers



ALL OUR GOODS CAN BE COVERED WITH ESE MATERIALS AND VELVET.



ILLUSTRATIONS HALF-SIZE. COMPETITIVE PRICES

Also Makers of Patent Spring Lid Cases "NOWATE" Write for List and Prices.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

An Elementary Theory of Deviation through Astigmatic Lenses.—II.

By E. MAYER (Paris).

The apparent image of a straight line in a front plane is deviated whenever this line is not in a meridian plane. The direction of this deviation depends on the sign of the co-efficient $p = \frac{P_1 - s - t}{P_2 - s - t}$ which was referred to in a previous article (*The Optician*, July 29). This sign is of importance. There are three cases to be considered.

$$\text{1st case} \begin{cases} P_1 < s \\ P_2 < s \end{cases}$$

This means that the physical images of oa_1 and oa_2 are virtual and erected.

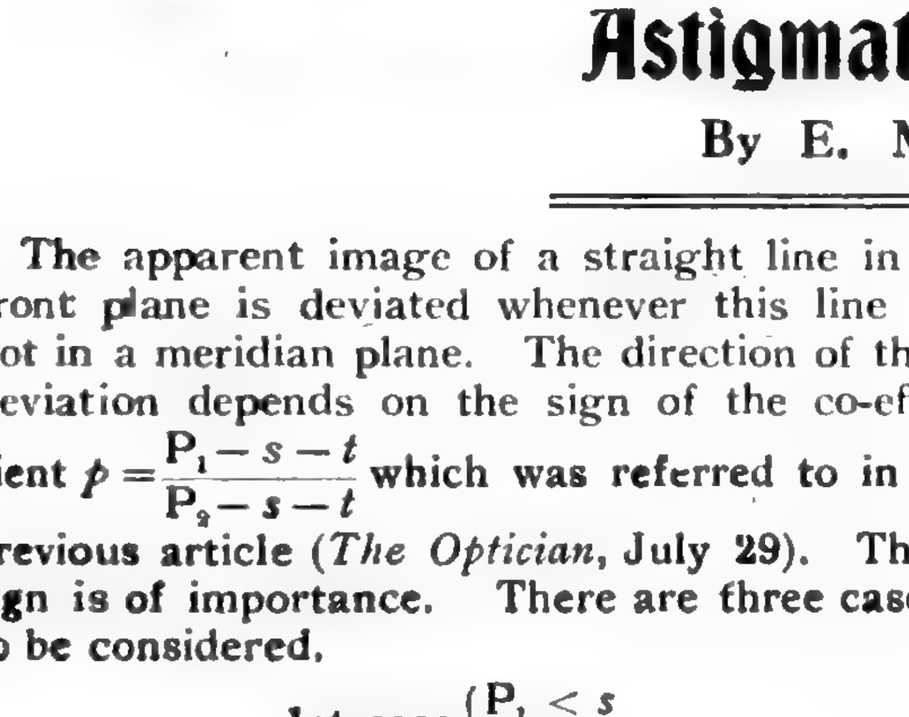


Fig. 1.

If the lens is convergent, the line is between the lens and the two principal anterior focals, and we have

$$\begin{cases} \frac{1}{s} < \frac{1}{P_1} \\ \frac{1}{s} < \frac{1}{P_2} \end{cases}$$

If the lens is divergent, we have $\begin{cases} P_1 < 0 \\ P_2 < 0 \end{cases}$

In both events, we have

$$\begin{cases} P_1 - s - t < 0 \\ P_2 - s - t < 0 \end{cases}$$

The co-efficient p is then *positive*.

$$\text{2nd case} \begin{cases} P_1 > s \\ P_2 > s \end{cases}$$

This means that the physical images of oa_1 and oa_2 are real and invested. The lens is convergent in all meridians and we have

$$\begin{cases} \frac{1}{s} > \frac{1}{P_1} \\ \frac{1}{s} > \frac{1}{P_2} \end{cases}$$

The eye can see the two real images provided it lies farther from the lens than them. Let us call y_1 and y_2 the abeisses of the two physical images. We have

$$\begin{cases} P_1 = s + \frac{1}{y_1} \\ P_2 = s + \frac{1}{y_2} \\ \frac{1}{y_1} > t \\ \frac{1}{y_2} > t \end{cases}$$

Then

$$\begin{cases} P_1 - s - t > 0 \\ P_2 - s - t > 0 \end{cases}$$

Co-efficient p is still *positive*.

$$\text{3rd case} \begin{cases} P_1 < s \\ P_2 > s \end{cases}$$

This means that the physical image of oa_1 is virtual and that of oa_2 is real. The lens is convergent in the second meridian and may be either convergent or divergent in the first one.

The eye being farther from the lens than the real image, we have

$$\begin{cases} P_1 - s - t < 0 \\ P_2 - s - t > 0 \end{cases}$$

Co-efficient p is then *negative*. The image of the straight line is virtual and erected in some meridians, and real and inverted in some others. It may be called a *mixed image*.

To the observing eye, the inclination of the

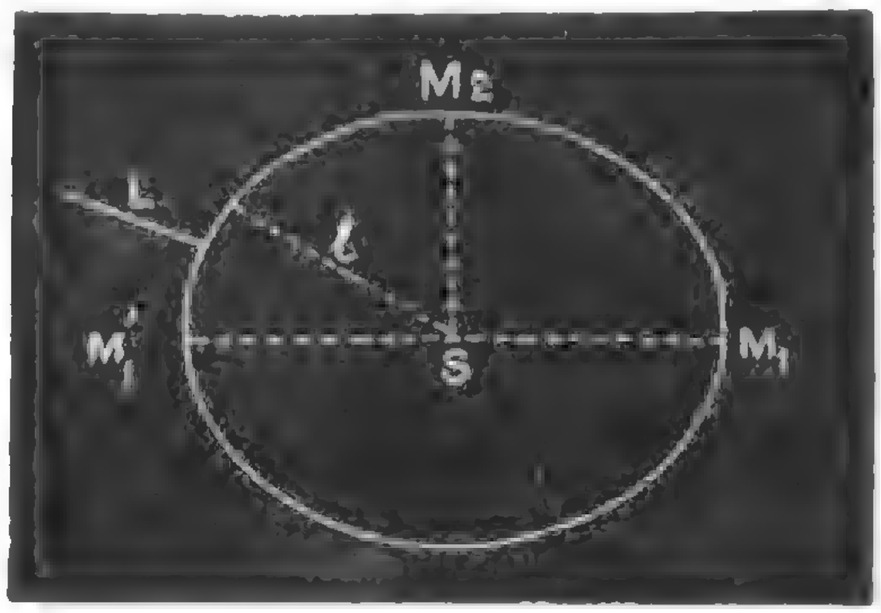


Fig. 2.

apparent image upon the meridian is not what is the most sthriking. It is rather the inclination of the image upon the perspective of the

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

line, in other words the angle $(y-x)^\circ$. This we shall call the *apparent deviation* and represented by δ.

$$tg\,\delta = \frac{tg\,y - tg\,x}{1 + tg\,y\ tg\,x}$$

From equation (3) we may conclude the following ones.

$$\begin{cases} (6)\ tg\,\delta = (p-1)\dfrac{tg\,x}{1+p\,tg^2 x} \\ (b\ \text{bis})\ tg\,\delta = (P_1 - P_2)\dfrac{tg\,x}{P_2 - s - t + (P_1 - s - t)tg^2 x} \\ (b\ \text{tor})\ tg\,\delta = (P_1 - P_2)\dfrac{tg\,x}{P_1 + P_2 - (s+t)(1+tg^2 x)} \end{cases}$$

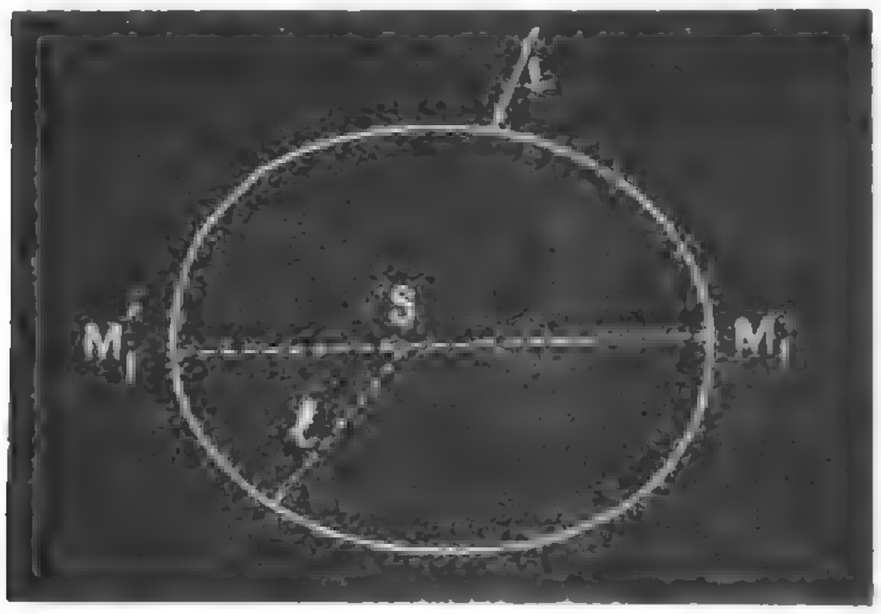


Fig. 3.

These formulas give the sign of δ in each case.

Let us call

$\begin{cases} SM_1 \text{ the meridian of least power.} \\ SM_2 \text{ the meridian of greatest power} \end{cases}$

$$\text{1st case} \begin{cases} P_1 < s \\ P_2 < s \end{cases}$$

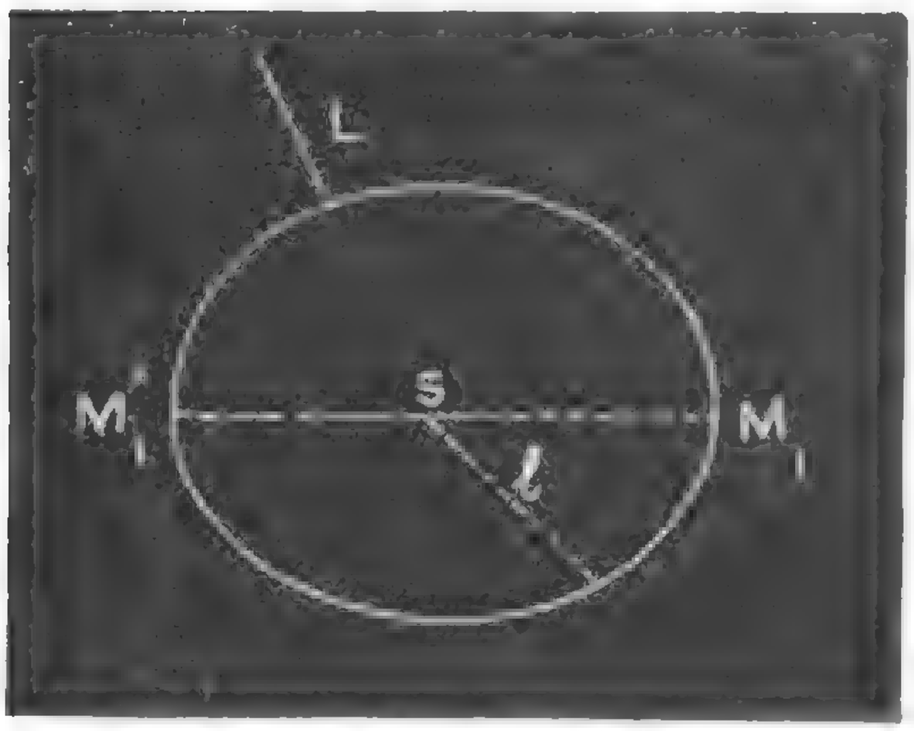


Fig. 4.

In formula (6 bis.) the denominator is negative as well as $(P_1 - P_2)$. Then $tg\ \delta$ has the same sign as $tg\ x$.

When x is between 0° and 90° (fig. 1), $tg\ x$ is positive. The image being erected, δ is between 0° and 90°. The apparent deviation is *positive*.



Fig. 5.

When x is between 90° and 180° (fig. 2), $tg\ \delta$ is negative. The apparent deviation is *negative*.

We can see on these figures that the apparent image sl is between the perspective L and meridian M_2.

$$\text{2nd case} \begin{cases} P_1 > s \\ P_2 > s \end{cases}$$

In formula 6 bis.) the denominator is positive. Then $tg\ \delta$ has a sign contrary to that of $tg\ x$.



Fig. 6.

When x is between 0° and 90° (fig. 3), $tg\ \delta$ is negative. The image being inverted, deviation is *negative*.

When x is between 90° and 180° (fig. 4), $tg\ \delta$ is positive. The deviation is *positive*.

The image l is then between the inverse prolongation of perspective L and meridian M_1M_1'.

$$\text{3rd case} \begin{cases} P_1 < s \\ P_2 > s \end{cases}$$

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Consider Everything and Judge.

AN opinion based on insufficient data is valueless. Consider the **L.O.C.** Rx Service offered to Sight-Testing Opticians in this country. The facts are :—

(*a*) Our equipment is the latest of its kind. Appliances are often scrapped for those of newer pattern.

(*b*) Our staff is highly skilled; at one with us in rendering efficient service, and absolutely trustworthy.

(*c*) Our organisation is so arranged as to facilitate work at high speed.

Special rush jobs are in hand five minutes after receipt and, provided the work involved is reasonable, sent back by return of post.

(*d*) Our prices are the lowest consistent with sound workmanship.

These are the facts on which we solicit your patronage. Examine them and decide as to the destination of your next Rx order.

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris. France.

Also at—2, Str-Barsei, Bucharest, Roumania.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

OPTICAL MANUFACTURERS LTD.,

(Incorporating Wheway Optical Co., Ltd.)

WAR TIME CONTRACTORS TO THE ARMY SPECTACLE DEPOT.

THINK OF THE MONEY YOU LOSE every year (and the dissatisfaction given) because your customers bring back Rimless Spects or Eyeglasses complaining that Lenses have worked loose.

This Trouble and Expense can be entirely avoided by using

The New Patent Tied Straps.

Any wholesaler will supply you with Finger Piece or Rimless Spect. Mtgs. fitted with above.

Works at VYSE STREET and GEM BUILDINGS, HOCKLEY HILL, BIRMINGHAM.

London Office: 55, HATTON GARDEN, E.C.1.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Here the denominator may be positive or negative because p is negative.

When x is positive and near 0° (fig. 5), formula (6) shows that the sign of $tg\ \delta$ is contrary to that of $tg\ x$. The image being erected, deviation is *negative*. Then formula $y = p\ tg\ x$ shows that y is negative and its absolute value is less than 90°.

When x is a little less than 90° fig. 6), the

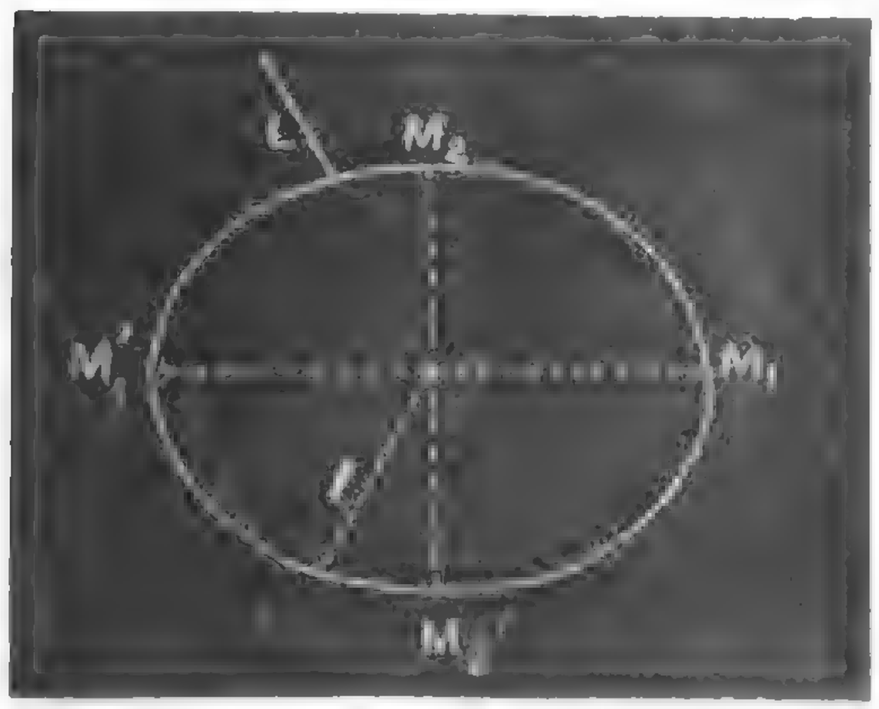


Fig. 7.

denominator of (6 bis.), is negative. Then $tg\ \delta$ is positive, and the image being inverted deviation is *positive*. Formula $y = p\ tg\ x$ shows that y is negative and its absolute value is less than 90°.

When x is a little more than 90° (fig. 7), the denominator of (6 bis.) is negative, $tg\ \delta$ becomes negative and $tg\ y$ positive. The image is inverted. Then y is between 180° and 270°.

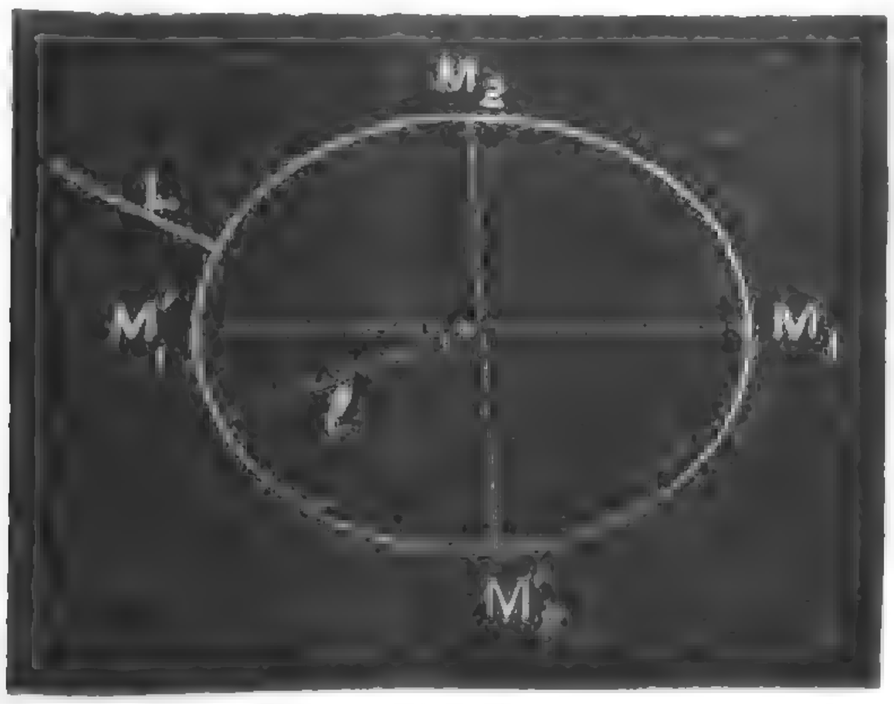


Fig. 8.

When x is a little less than 180° (fig. 8), the denominator of (6) is positive. Then $tg\ \delta$ becomes positive and $tg\ y$ remains negative. The image is erected and y is still between 180° and 270°.

You can see on these four figures that the apparent image is always in the angle of the two meridians in which the line L or its prolongation is not situated.

Conclusion.

Observation of the deviation of the apparent image may serve to make a discrimination between the two principal meridians. But it is necessary beforehand to discriminate between a virtual and a real image.

If the image is real, it lies between the lens and the eye provided this latter is sufficiently removed. If the image is virtual, it lies in the other side of the lens. The discrimination may be made, with parallax method, by observing the parallax movement of the perspective of the image *upon the lens* (and not upon the front plane of the line).

Having been ascertained that the image is virtual in both principal meridians, observe that the apparent image lies between the perspective of the line and a meridian; this is the meridian of *greatest power*.

If the image is real in both meridians, it lies between the line and the meridian of *least power*.

Should the image be virtual in one meridian and real in the other, the first is of *least power*.

Another method of discrimination can be found by rotating the lens and observing either a pendulum rod ,or a continued movement of the image. This procedure will be explained in a later copy of *The Optician and Scientific Instrument Maker*.

Marriage of Mr. H. C. Bateman.

Mr. Hugh Campion Bateman, only son of Mr. F. W. Bateman, F.R.A.S. was married on Thursday last week to Miss Winifred Rowe, daughter of Ald. J. W. Rowe, J. P., O.B.E. and Mrs Rowe, of the Grange, Orton Longueville. The bridegroom, who served as an artillery officer during the War, is a director of the firm of Frederick Bateman, Ltd., of London. The wedding ceremony at which the Vicar of Orton Longueville officiated, was a brilliant function; and a great number of handsome presents attested the popularity of the happy pair.

New Company.

W. Dalby, Ltd.—Private Company. Capital £1,000 in £1 shares. To carry on the business of wholesale and retail chemists, opticians, photographic supplies dealers, stationers, etc. The first directors are: W. Dalby, 167, Charnwood Street, Leicester, and K. C. Biggs 51, Highfield Street Leicester. Qualification 1 share. Registered Office: 167, Charnwood Street, Leicester.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

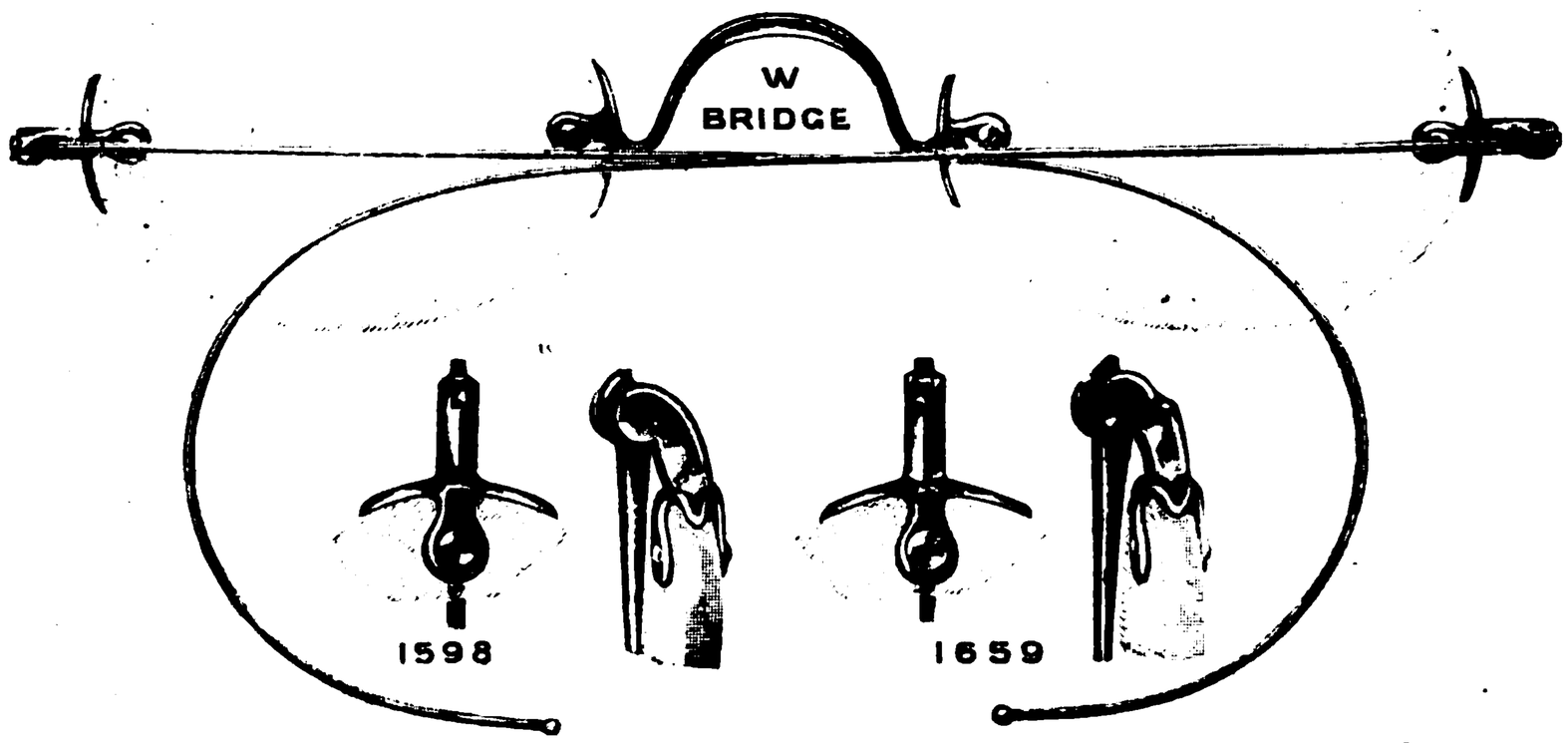
QUALITY FIRST

DUPAUL, YOUNG OPTICAL CO.,

ESTABLISHED 1888.

SOUTHBRIDGE, MASS., U.S.A.

Manufacture only Guaranteed Quality and Best Finish Gold-Filled and White Metal Spectacles, Eyeglass Frames, Astigs, Mountings and Materials.



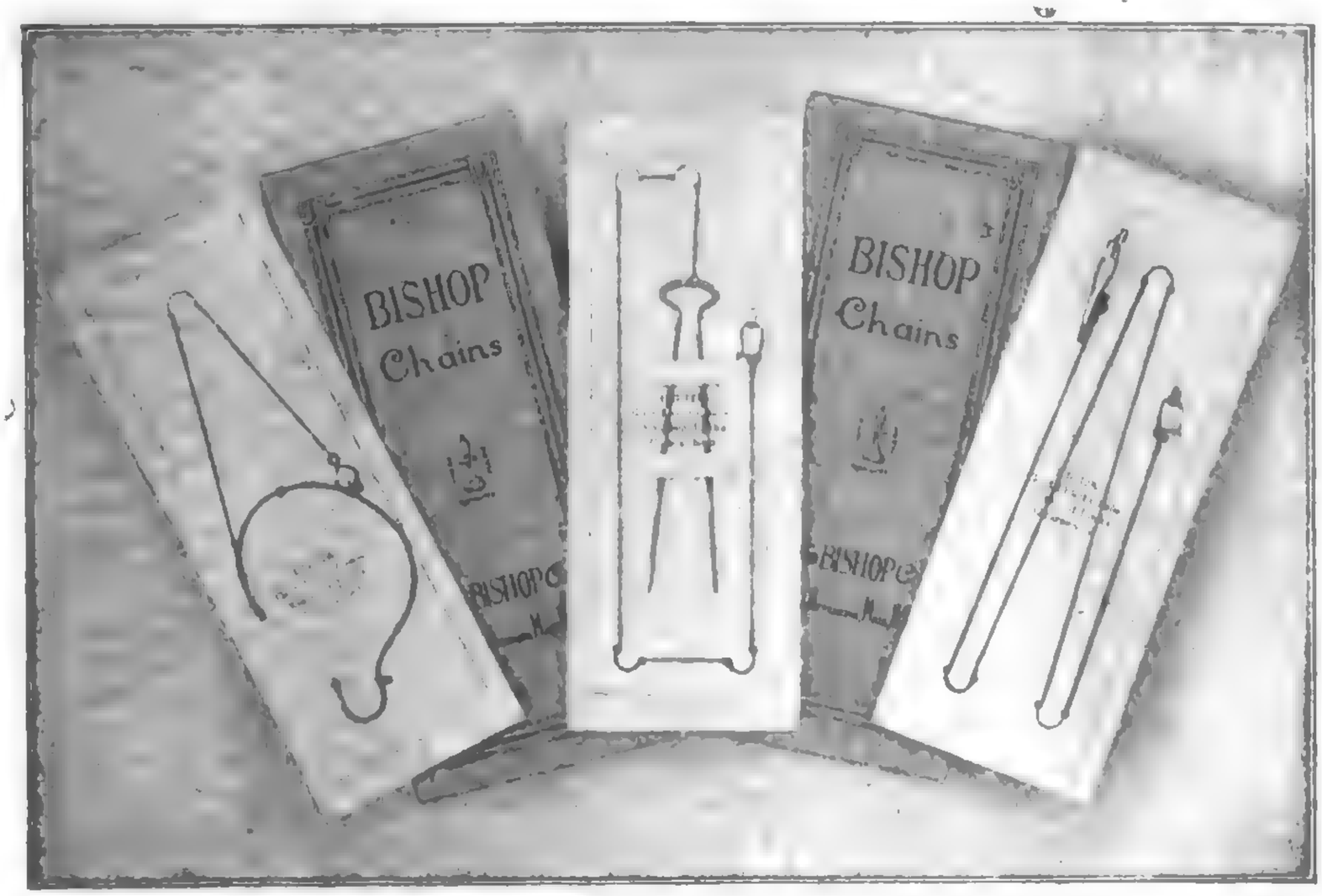
To be obtained from all Wholesale Optical Houses.

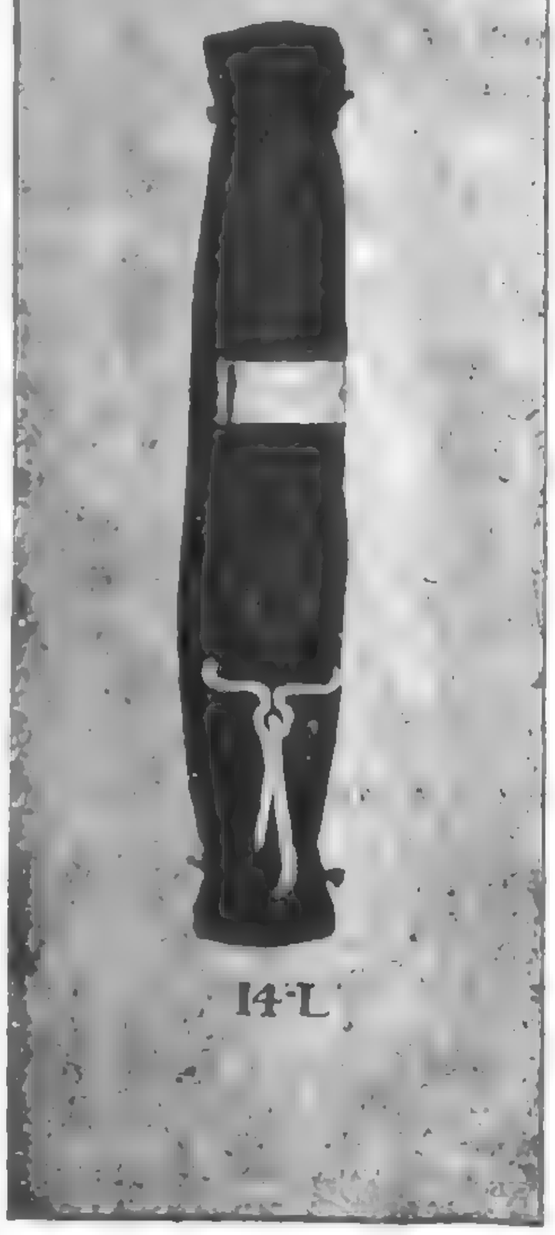
LONDON OFFICE: **S. PULZER,** 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. Telephone: CENTRAL 7241

Digitized by Google

Original from THE OHIO STATE UNIVERSITY





BISHOP CHAINS

should be your standard of Quality,
in solid Gold and Gold Filled,

BISHOP SILK EYEGLASS CORDS AND MONOCLE RIBBONS.

With Gold Filled, Silver or Gun Metal snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.



To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

On the Direct Determination of the Powers of Lenses.*

By J. A. TOMKINS, A.R.C.S., Technical College, Bradford.

In ophthalmic practice, as is well-known, lenses are usually specified in terms of their powers rather than of their focal lengths. The power of a lens may be determined in one of the following ways:—(*a*) From its focal length, as measured by various methods, (*b*) by means of the spherometer or lens measure, (*c*) by neutralisation with a lens of known power selected from a trial case—all more or less indirect methods. (*a*) is simple and accurate and need involve but little calculation; (*b*) depends on a knowledge of the refractive index of the glass. The lens measure, as used in the optical trade, is a modification of, but less accurate than, the spherometer. It is graduated for a given refractive index, usually about 1.52, this being the average refractive index of the glass used in ophthalmic lenses; (*c*) is the method employed in ophthalmic practice, and it is recognised as the quickest and most convenient method of checking the powers of lenses.

But, by this method, in the case of strong lenses, there is (1) the difficulty of getting complete neutralisation over the whole field, and (2) the fact that, owing to the non-coincidence of the principal points, the powers of the neutralising lenses are not equal. The condition for neutralisation is the numerical equality of adjacent vertex powers, the adjacent vertices being in contact.

For this reason it has been suggested recently (W. Swaine, *The Optician*, Dec. 17th and 24th, 1920), that trial lenses be re-marked according to vertex powers instead of, as now, the powers referred to the principal points. The vertex system was originally suggested by Biot in 1811, and has been employed since by several authorities. A useful method for the direct determination of the power of a convergent (positive) lens was described by the late S. P. Thompson in 1899, but does not appear to be generally known or used.

It depends on the fact, pointed out by Toepler, that the lateral magnification of an image formed by the refraction of paraxial rays through a centered system of spherical surfaces is proportional to the distance of the image from the principal focus of the image-space, being zero at this point and increasing by unity in distances equal to the focal length of the image-space.

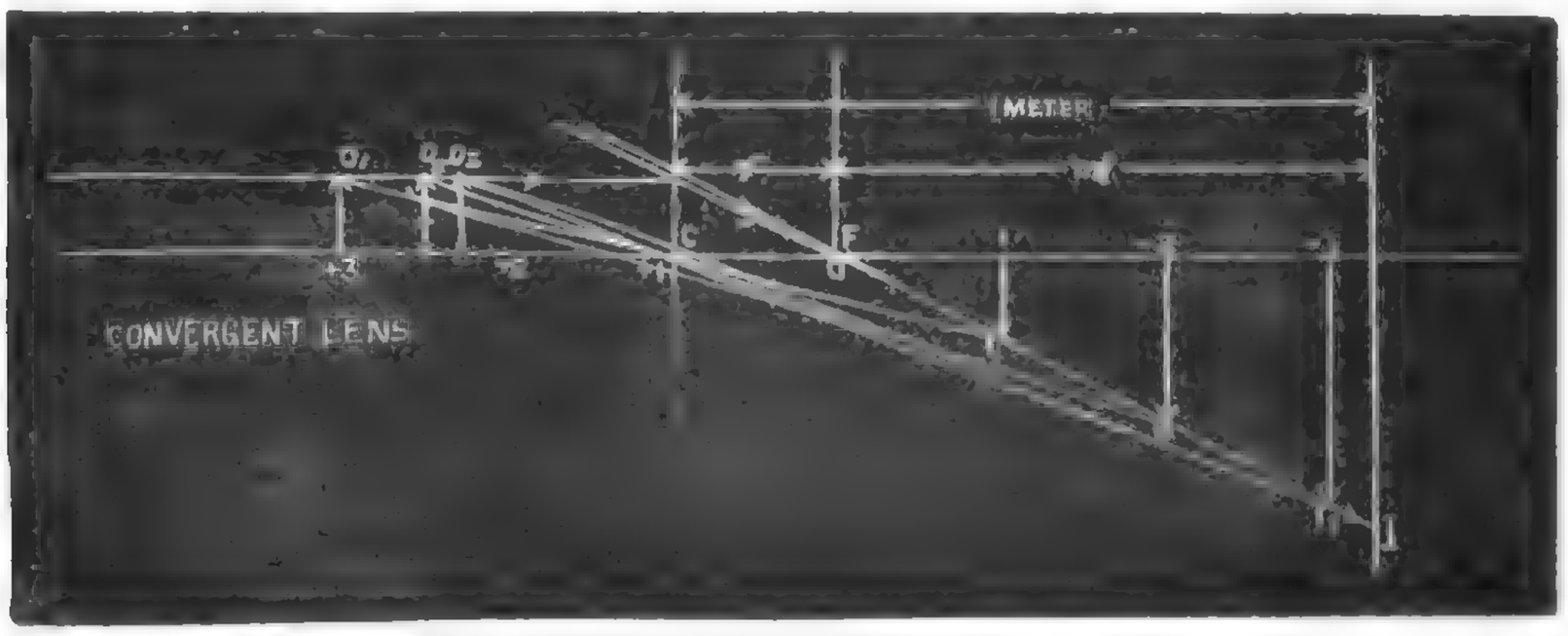


Fig. 1.

The optical imagery is shown in fig. 1, in which O_1, O_2 and O_3..., represent successive positions of an object-point on a ray parallel to the principal axis, and I_1 I_2 and I_3..., the corresponding positions of the image-point formed at distances of 1, 2, 3..., focal lengths from the principal focus F, the magnification being indicated by numbers after the manner suggested by Blakesley. If, therefore, a screen be placed at a fixed distance of 1 meter from a convergent lens of focal length f meters mounted on an optical bench and the cross-wires be adjusted until an image I is focused on it, the numerical value of the magnification, m, is given by the relation

$$mf + f = (m+1)f = 1,$$

* From the 'Philosophical Magazine.'

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

NORTHAMPTON POLYTECHNIC INSTITUTE,
Clerkenwell, London, E.C.1

DEPARTMENT OF OPTICAL ENGINEERING & APPLIED OPTICS

SESSION 1921-22.

TECHNICAL DAY COURSES

FOR **OPTICIANS** AND
OPTICAL INSTRUMENT MAKERS.

Whole-time day courses in optical work will commence at the Institute on Monday, 3rd October, 1921. **Entrance Examinations**, 27th and 28th September, 1921. These courses are specially adapted to meet the varied requirements of the optical trade.

Should a sufficient number of students apply for enrolment, day apprentices classes will also be held, each student attending alternate weeks for one week continuously.

EVENING TECHNICAL COURSES

for Opticians and Optical Instrument Makers will be offered, the session, for these courses commencing on Monday, 26th September, with enrolments during the preceding week.

Full particulars as to fees, dates, &c., and all information respecting the above courses and also the Engineering and other work of the Institute, can be obtained at the Institute, or on application to—

R. MULLINEUX WALMSLEY, D.Sc., *Principal*

ARTIFICIAL EYES
SHELL and REFORM.

GENUINE BRITISH MADE
EYES ARE THE BEST IN THE WORLD.
We are the Actual Makers.
Why Buy Inferior German?

Artificial Eyes re-enamelled by an improved process which gives the Finest Results Obtainable.

ALBERT E. WATERS, Empire Works,
Mole Street, Sparkbrook, Birmingham.

TERRA AURORA OPTICAL Co.,
2a, Ashdown St., Kentish Town, N.W.5
Phone: HAMPSTEAD 4875

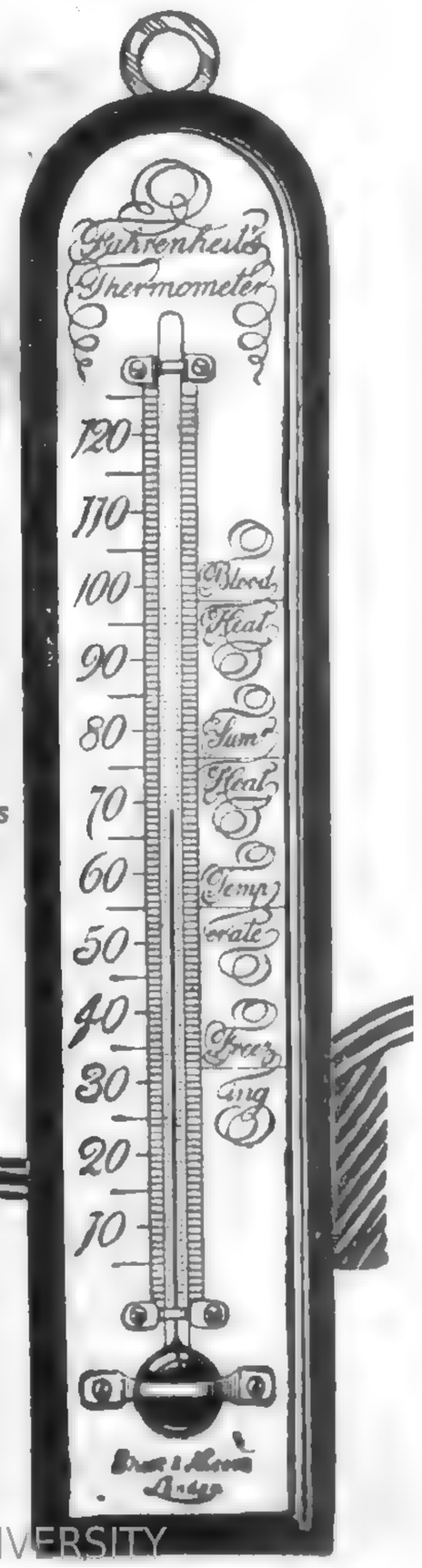
Accessories for the **MICROSCOPE,**
POCKET APLANATS, LENSES,
PRISMS, FLATS and PROOF PLATES.

Repairs to all kinds of Scientific Apparatus and Prism Binoculars carried out in our own factory.

EXPERIMENTAL WORK.
MAXIMUM EFFICIENCY. MINIMUM CHARGES.

A Thermometer of Character

Reproduction of an Antique design, Plain red spirit tube, lacquered brass scale on period finish Oak mount.



SHORT & MASON LTD.,
Scientific Instrument Makers,
Aneroid Works,
WALTHAMSTOW,
LONDON, E.17

Write for particulars and general booklet.

No. 3710 (half size).

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Hospital Rx Work

A REVOLUTION IN PRESCRIPTION PRICES

We have just Organised a New Department to cope with Large Quantities of

HOSPITAL AND EDUCATIONAL CONTRACT WORK PROMPTLY AND ACCURATELY

AT EXECEPTIONALLY LOW PRICES

SEND FOR PRICE LIST.

Telephone: HOLBORN 1620 (Private Exchange).

KIRK BROTHERS WHOLESALE & MANUFACTURING OPTICIANS

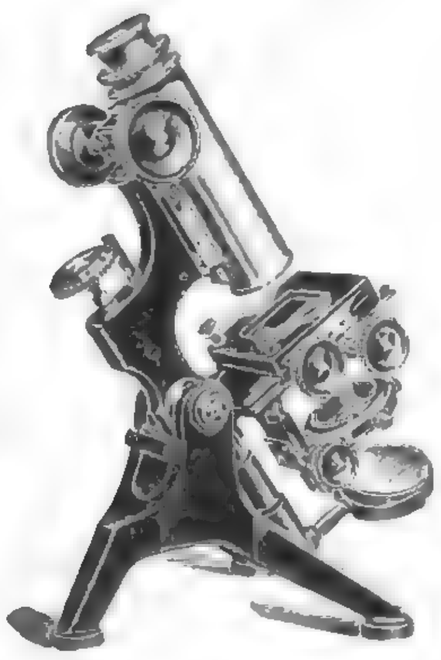
Telegrams: KIRBROREX, HOLB. LONDON.

86, GRAY'S INN ROAD, LONDON, W.C.1

SELL WATSONS' BRITISH-MADE

MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur. the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,

313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1837

F. PARKER WOOD,

Wholesale Manufacturing Optician,

47, MARK LANE, E.C.3

Immediate delivery from stock:

TELESCOPES
FIELD GLASSES
PRISM GLASSES
MICROSCOPES
ANEROIDS & CLOCKS
BAROGRAPHS
SEXTANTS
BINNACLES
COMPASSES

CHRONOMETERS, New & Second-hand

Repairs a Speciality.
Clinicals and all other Thermometers.

PARALLEL GLASSES of every description.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

whence $m + 1 = \frac{1}{f} = D.$

The power of the lens, in diopters, is thus simply (Magnification + 1).

The cross-wires may conveniently be two parallel wires fixed 1 cm. apart so that the magnification can be read off directly on a centimeter scale. This method does not apply to convergent lenses having a power of less than +1D, nor to divergent lenses. Neither is it very convenient for convergent lenses of less than about +2D on account of the great distance of the cross-wires from the lens.

The powers of such lenses could, however, be determined indirectly by combining them with a convergent lens of suitable power and then measuring the power of the combination. But the method can be applied directly and conveniently to divergent lenses by the simple modification of the previous arrangement shown in fig. 2, which has not, so far as the writer is aware, been previously described.

As before, a ray parallel to the principal axis is the locus of successive object-points (not shown) and the divergent ray FI is the locus of corresponding image-points. Hence for a certain position O of the object-point the image-point will be at I on a screen 1 meter from the lens. O is the point of intersection of the ray CI through the optical centre with the incident ray. The "object" here is obviously a virtual object formed by rays converging towards O and intercepted by the divergent lens.

In this case we have

$$mf - f = (m - 1)\, f = 1,$$

whence $m - 1 = \frac{1}{f} = D,$

or, the power = (Magnification − 1). The virtual object is obtained by taking a convergent lens of suitable power and adjusting it with respect to the cross-wires until a real image of the same size is formed on a second screen. The image will then be at one of the "negative principal points" of Toepler, or "symmetric points" of S. P. Thompson, and the distance between the cross-wires and the auxiliary lens will be approximately twice the focal length of the latter. This position having been found, the auxiliary lens support is fixed rigidly to the screen carrying the cross-wires, and the two are adjusted until an image of the latter is formed by the divergent lens on the fixed screen. The power, $m - 1$, is then read off directly as before.

By paying due regard to the signs of m and D both equations may be written in the form

$$D = 1 - m.$$

A little care is necessary in the choice of the

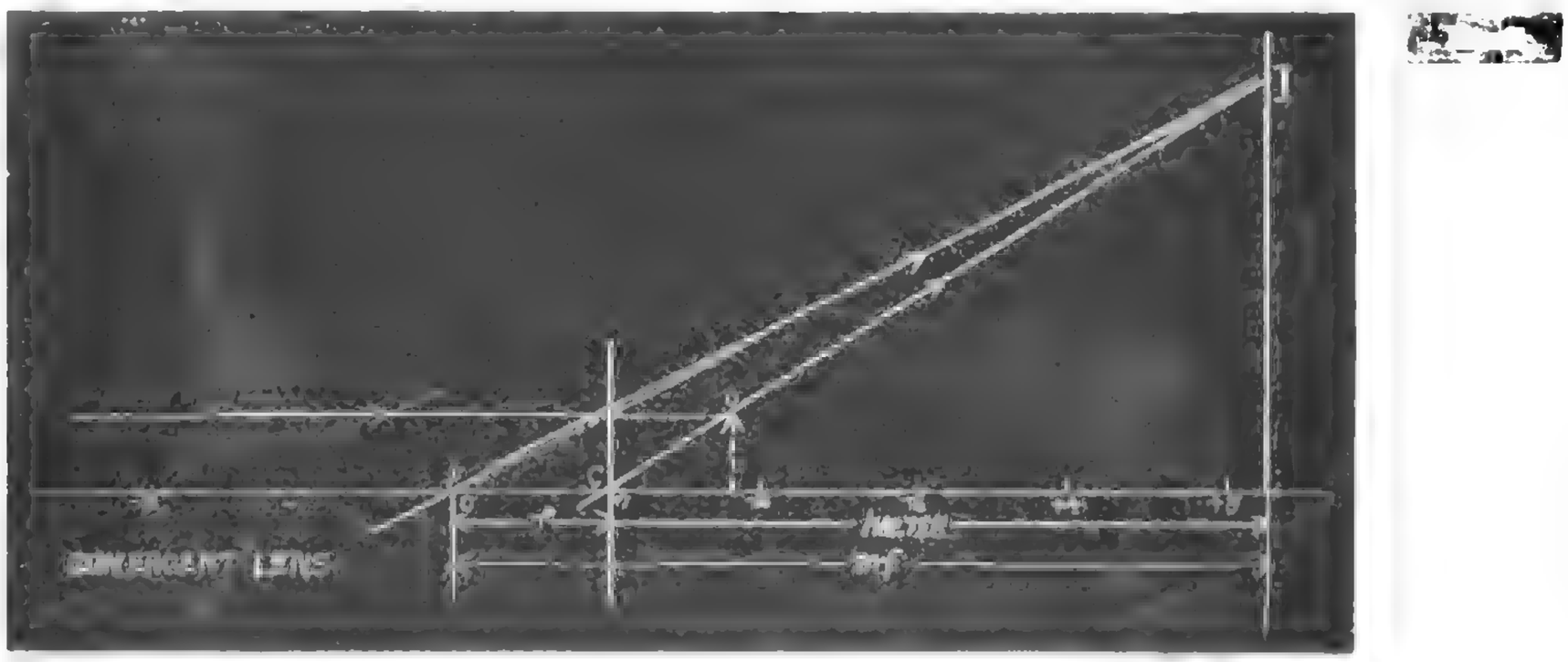


Fig. 2.

auxiliary lens as, if its focal length is too small, it will not be possible to form the virtual object in the required position; while if, on the other hand, it is greater than is necessary for this, the distance between the lens and cross-wires may be inconveniently great. Thus, for a −1D lens, the magnification will be 2 and the virtual object will be midway between the lens and the screen, *i.e.*, 50 cm. from the lens. This is therefore the minimum distance between the cross-wires and the auxiliary lens, so that the minimum focal length of the latter is about 25 cm. This method, unlike the previous one, is applicable to lenses of less than −1D but, for the reason just indicated, becomes less convenient as the power of the lens decreases, the minimum distance between cross-wires and auxiliary lens being about 67 cm. for a −0.5D lens. For a similar reason the method is inconvenient in practice for convergent lenses of less

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

than +1D.

For thick lenses and lens systems, the screen must be 1 meter from the second principal point which can be readily found by the usual methods.

The writer wishes to thank one of his students, Mr. W. R. Lynas, for kindly making the diagrams.

Three New Optical Appliances.

The Terra Aurora Optical Co., of 2a, Ashdown Street, Kentish Town, London, are introducing through the ordinary channels of trade three new and original patent devices that are constructed upon optical principles, and as such may be designated optical appliances.

The Pluviscope.

It is perfectly obvious that any person driving or controlling a power propelled or mobile agent in inclement weather is exposed both to grave risks and personal discomforts when the usual weather screens fail and can no longer be conveniently used owing to their visual transparency being rendered void by falling snow, rain or mist, gathering upon the surface. In order to overcome these difficulties and as a practical solution of the trouble the Pluviscope has been constructed. This is a device whereby the forward perspective is transmitted to the vision of the individual driver or observer by the aid of the transmission effected with total reflecting planes. This device was conceived in the early part of 1915, but its development was unavoidably held over owing to the War.

The Pluviscope is constructed in the form of an elongated transversely shaped rhomboid, the end segments in rhomboid form constituting an anchorage seating for the transverse or crosswise connecting segments, the ends of the rhomboid being at a sufficient transverse distance from each other to permit a sufficient transverse angle of observation, and the total collective height of the rhomboid to give a clear view of external objects in the upper half section facing the observer. Attached to the outer extremities of the device in the centre of the rhomboid ends are pinions that are constructed to revolve in permanent trunions so that the whole structure may be revolved when required. The transverse connecting segments, elongated and fitting into the end segments with their several edges in contact with each other upon and along their line of greater length, thus form a hermetically sealed hollow rhomboid chamber, two of the transverse segments consisting of total reflecting planes internally facing and inclined, one in the rear lower section and the other in the upper forward half section, but relatively parallel with each other. The back of each mirror is covered with a transverse connecting sheath that also holds the end segments in position.

The other two cross segments consist of transparent planes and are to protect the mirror planes. One of these transparent segments constitutes the weather glass upon its external surface and is situated under and beneath, the inclination of this segment, being in the most favourable position to escape the weather conditions. The other segment is placed near the observer in a protected position and relatively parallel with the weather plane. When the device is in practical operation for effective reflecting transmission the outer contour of the rhomboid effectually closes the weather port. The incident or entering perspective after passing through the downward inclined face of the weather glass is then taken up by the first mirror plane, inclined to transmit the view on to the upper or second reflexion, the second reflexion passing the view over the first mirror through the other transparent segment on to the eye of the observer. All external objects thus appear in their true positions.

When weather conditions are favourable the mirror planes may be thrown out of action entirely by rotating the device one quarter of a revolution, and direct vision obtained through the transparent segments, when the weather port becomes partly open both top and bottom. Or in the event of mist gathering upon the weather glass the device is rotated one half revolution, when the order of transmission is reversed and the protected glass becomes the weather glass, and the weather glass comes into a position near the observer so as to enable the gathered moisture to be easily removed. The several different positions are checked by a locking arrangement. The apertures of the device when the weather port is entirely closed place the aperture of incidence outside from the centre waist line of the rhomboid to the lower apex, and the aper-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

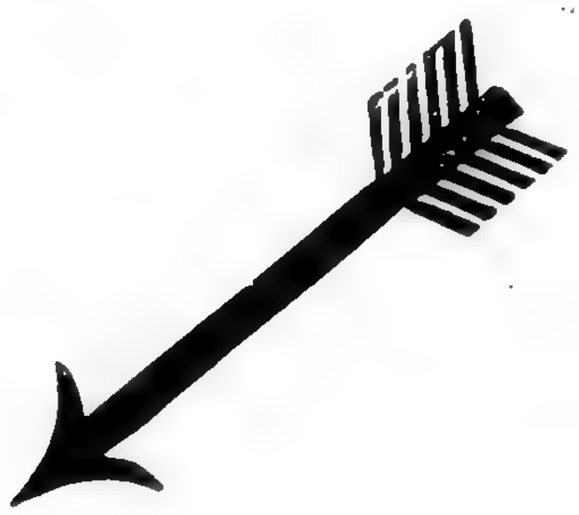
The National Association of Opticians.

President:
Mr. A. HERSHBERG, Manchester.
Hon. Secretary:
Mr. E. MOEVIUS.
17, Rathbone Road, Wavertree, Liverpool.
Mr. C. ADAMS, Oldham.
Mr. T. S. BAIRD, Glasgow.
Mr. T. BEARDSALL, Manchester.
Mr. D. R. JONES, Liverpool.

Vice-Presidents:
Mr. W. J. S. GREEN, Birmingham.
Mr. R. CHALMERS, Sunderland.
Hon. Treasurer:
Mr. H. W. DAYKIN,
5, King Street, Alfreton.
Mr. J. W. OBERLE, Manchester.
Mr. L. MORETON PARRY, Liverpool.

Hon. Solicitors:
MESSRS. ARTRO MORRIS & CO., Solicitors, 2 & 4, Harrington Street, Liverpool.

THE PROPOSED PANEL OF OPHTHALMIC OPTICIANS



Should be taken as a warning by all Sight Testing Opticians, who are as yet outside any organisation, to join the above Association and so help to protect their own interests against such an attempt as is now being made by The National Insurance Beneficent Society, who seek to benefit one group of individuals at the expense of another group of individuals, and so help to spread in a fresh direction the noxious system of the National Health Insurance Act, which as experience has proved, tends to pauperise the patient, and, at the same time, tends to encourage the rendering of indifferent service by the practitioner.

NOTE:—Forms of Application for Membership may be had from the Hon. Secretary. The Subscription is 21/- yearly, which includes free delivery of "The Optician."

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



CHEMICO CLEERVIEW.

Is the invention of a Spectacle user, who is also a chemist, who realized that sight might be considerably improved by the SCIENTIFIC CLEANSING and polishing of the lenses of SPECTACLES, EYEGLASSES, Etc.

Polishing the lenses by the usual method with the pocket handkerchief does not give that clear view and power of which the glasses are capable.

CHEMICO CLEERVIEW is a perfect cleanser and polish and has the peculiar property of preventing fogging and steaming.

THE COUNTY CHEMICAL Co., Ltd., Chemico Works, BIRMINGHAM.

Rx

SANDRO LOWY

Optical Rx Specialist,

88, Goswell Road,

LONDON, E.C. 1

Telephone: CITY 304 (two lines)

Telegrams: SANOPTIC, LONDON.

Rx

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

ture of observation from the waist line to the upper apex upon the waist side of observation.

The Rearflex or Direct Vision Mirror.

Many serious and frequent fatal accidents are recorded owing to the driver of a swiftly moving automobile or vehicle not being sufficiently acquainted with the conditions prevailing in the immediate rear. A momentary turn of the head to observe an overtaking vehicle when a concentrated forward attention was essential, a turning without due caution into a side avenue, an incautious start from the footpath edge to the road centre at an untimely moment when another vehicle is passing the same identical position have all contributed to the serious necessity of some means to observe or locate the conditions prevailing in the rear.

Various safety mirrors have been devised and adopted for this purpose both in the form of plain mirrors and others of a convex type each placed in a position for observation that best served the purpose required. The use of the plain mirror has the disadvantage of a limited field of view, apart from the unfavourable angle of observation; also the convex form, although giving a larger field, has the disadvantage of portraying a very distorted image pretaining to that type of aberration. The Terra Aurora Optical Co., have after numerous experiments designed the Rearflex to give a larger field of observation yet strictly true in detail, portraying in stereoscopic and lucid relief and also capable of being adjusted to suit all requirements whereby objects of the rear perspective appear in the near front, within the vision of the controlling observer at their true distance, which also enables the driver to steer backwards without the necessity when reversing for turning round to locate the position.

The interior optical principle to effect the desired purpose is simplified as far as possible, so that a maximum amount of illumination shall be transmitted. It consists of two convex or positive lenses acting in conjunction with two planes of total reflexion in suitable positions, one of the reflecting planes receiving the incident beams and comprising in its contour a semi-reversing diagonal of original features for collecting and semi-reversing the view before it enters the positive lenses, and thereby renders it possible to have in conjunction with the use of these lenses both the collecting aperture of incidence and the visual aperture of observation upon the same side of the instrument. The two openings are separated to any distance that is necessary to clear any interposing obstacle that may obstruct the view of the observing focal plane for portraying the same in the immediate front vision of the driver. The instrument may be utilised in either a horizontal right or left position, or in a perpendicular position, and is also fitted with an adjusting device whereby the angle of view may be regulated to suit the particular vehicle to which it is permanently attached.

The Super Brilliant Correct Image Finder for Photographic and other Purposes.

This finder gives a most brilliant and non-reversed image, and is particularly adapted for photographing moving objects, as this especial feature greatly assists the operator and avoids the confusion so prevalent amongst amateur photographers, and reduces the liability of failure owing to the view being portrayed in its actual position upon the correct side of the focal plane. Those interested in any of these particular instruments should communicate with the Terra Aurora Optical Co., of 2a, Ashdown Street, Kentish Town, who will be pleased to answer all enquiries.

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

Lamp-Blown Glassware.

Sir,—I read with great interest the letter of Mr. J. Moncrieff in your issue of August 26th. Since then I have been to the Board of Trade and, if the interpretation of the Act (Protection of Key Industries) by Messrs. Morrison and Palmer of the Board of Trade is correct, then the Act is useless.

These two gentlemen make this statement, that the price is the value—whether in marks, or our own currency. Depreciation of foreign currencies is not considered.

To make myself perfectly clear, suppose 15 marks represent a shilling, and if, as the Board of Trade inform me the duty (33⅓ p.c.) would be equivalent to 4d. on the 15 marks, that will in no way help the Scientific Glass-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

ware Industry the makers of thermometers in particular; as the wholesale price, delivered here from Germany and Czecho-Slovakia, averages ⅓ (one third) of that of English manufactured thermometers.

To give an example, 12" chemical thermometers, for which there is a great demand are being delivered here from the above countries at 6s. per dozen wholesale. It would be impossible to manufacture these in England at £1 per dozen with a profit.

If the statement made by those two Board of Trade officials (mentioned above) is correct we shall be penalising our late allies, France and Italy, as their currency has not depreciated to the alarming extent of German and Czecho-Slovakian currency. Our other ally's (America) currency has risen. This state of affairs is not likely to breed good feeling with our late allies.

The money that has been poured into the Glass Research Association by the Government and those interested in glass is being wasted if the Government officials are correct.

The only satisfactory solution is to treat these depreciated currencies as of their pre-war value and put the duty on accordingly—*i.e.* if the article is priced at six marks, (German) pre-war value which would roughly be six shillings, make the duty one-third of six shillings, and that would be two shillings on the six marks.

Severe as this may seem, it would be the only real and effective way of protecting the Key Industries; for none know better than the present Government the awful pickle in which this country was placed in the early part of the late war, through lack of scientific instruments and scientific glassware, owing to the free imports and dumping previous to the war; and if something is not done on the lines that I have sugegsted we shall be at the mercy of other countries after the key industries have been ruined.

JAMES T. NORTH.

Crescent Road, Friern Barnet, N.11.

A Pair of Spectacles from the Continent.

Sir,—With reference to your paragraph in *The Optician* of 9 Sept. last; it gives an account of the position taken by the Post Office officials with respect to a pair of spectacles that were broken in transit from the Continent. You observe that it would be interesting to know under what circumstances "the man at Peterborough" ordered his spectacles from the Continent.

I believe I can throw a little light upon the subject, by stating that this gentleman spent a holiday in Belgium, and probably during that time ordered them.

CLIVE W. RADFORD.

52, Cromwell Road,
Peterborough.

A Case for Diagnosis.

Sir,—Would any of your readers be able to explain this case?

A young fellow came to me to have a pair of glasses made up to a Rx. He was previously wearing OU +1.00 sphs. The Rx he brought was by one of Birmingham's well-known oculists and ordered

OD $\begin{matrix}+1.50\\+0.25\end{matrix}$ 120° ⌒ 1△ Base *in* OS $\begin{matrix}+1.50\\+0.25\end{matrix}$ 85° ⌒ 1△ Base *in* I supplied these last May. My client is 21 years of age, and his trouble is this:—He finds that he cannot concentrate his mind on anything for more than about two or three minutes at a time, and afterwards he gets what he describes as a "rainbow of pain" round his eyes and temples. Another symptom is that, when reading, every few seconds he gets "seeing two, three or four images." I am just quoting his own words; but it is certain that he gets diplopia.

After reading a column in the paper he cannot remember what he has read owing to the brain concentration required to keep his vision single. He came back last week to tell me that he does not find the glasses help him as he still gets the double vision. I might also add that about four or five years ago he had a nervous breakdown. I shall feel greatly indebted to any reader who can explain this case.

Birmingham. "QUALIFIED"

Messrs. Chance Brothers & Co., Ltd., have placed outside their works a bronze tablet on which are inscribed the names of fifty-five of their staff who were killed in the war. Out of 337 who joined up, 242 have returned to Messrs. Chance Brothers' employ.

Messrs. Troughton & Simms Ltd., have removed from Fleet Street to 5, the Broadway, Westminster, S.W.1.

Matter intended for the current weeks' "Optician" must reach this office on the Tuesday morning preceding publication.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Rx

LYONS' SERVICE

Our Aims are
Quality & Promptness
For High Class Rx Work.

—TRY US.—

Stock Orders solicited

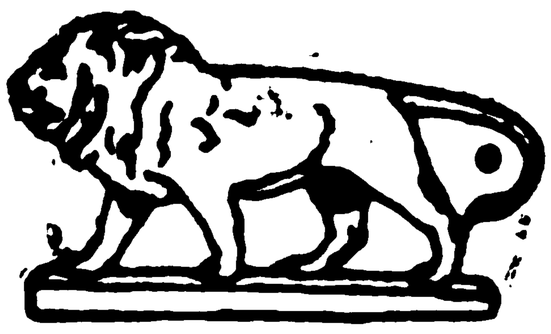
FULL STOCKS:—Gold and G. F. Cable Frames and Astigs, Rimless Mounts, Shell Goods, Cases, Cords, Chains and UNCUT LENSES.

F. H. C. Lyon,

Wholesale & Manufacturing Optician,

59-61, Hatton Garden, London, E.C.1

Telegraphic Address:
CYLTORREXO, SMITH, LONDON.



Regd. Trade Mark.

Telephone No.:
HOLBORN 1203.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

"You Cannot TRADE SQ MARK *Buy Better"*

STEVENS' QUALITY
Optical Goods

UNQUALIFIED approval meets this celebrated line wherever introduced.

WE are sole agents for the United Kingdom and can invariably supply your requirements from stock.

One Quality Only—The Best Made

1/10th 12ct. Gold Filled

Specialising in the Fingerpiece Mount

Send us your enquiries for
Spectacles and Eyeglasses—Frames and Mountings

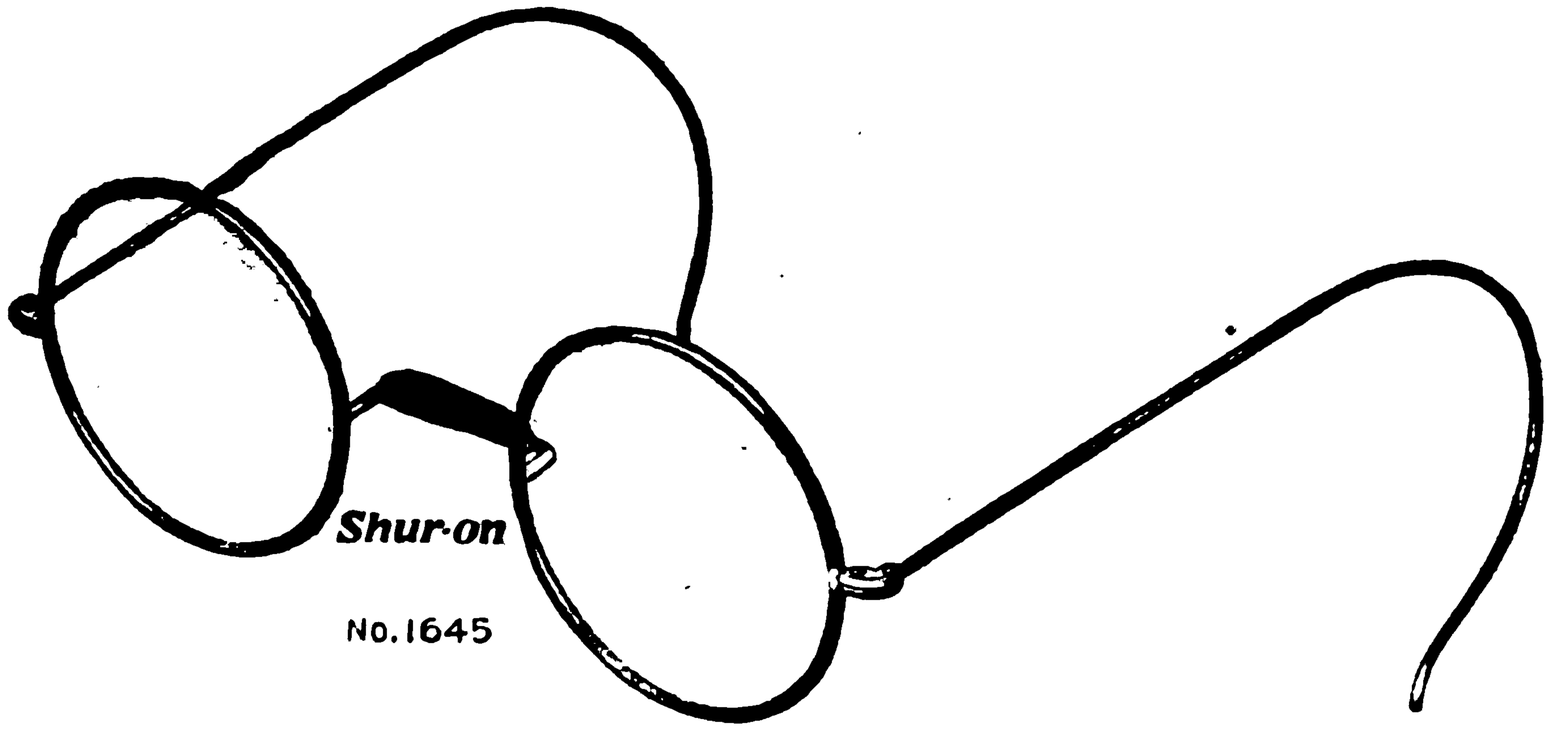
Complete Catalogues on Application

H. WILLIAMSON Ltd.
Optical Section
87/89 GREAT SAFFRON HILL, LONDON, E.C.1

General Optical Supplies—Prescription and Repair Work—
Fittings and Instruments—Optical Machinery

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Shur-on Glasses



Here's The Frame Your Patrons Have Been Asking For—

It's a Shur-on—practically all Shelltex! Still, a lightweight—dainty and neat! And metal lined throughout—for rigidity and strength; With all tubetex temples. *And a Shelltex covered bridge*—for easy adjustability—for supreme comfort to sensitive noses—for smart style! In short, it's just what your patrons have long wanted. Adapts itself readily to slender features. It balances the face.

If your wholesaler can't supply you write us direct.

SHUR-ON OPTICAL Co.,

Rochester, N.Y., U.S.A.

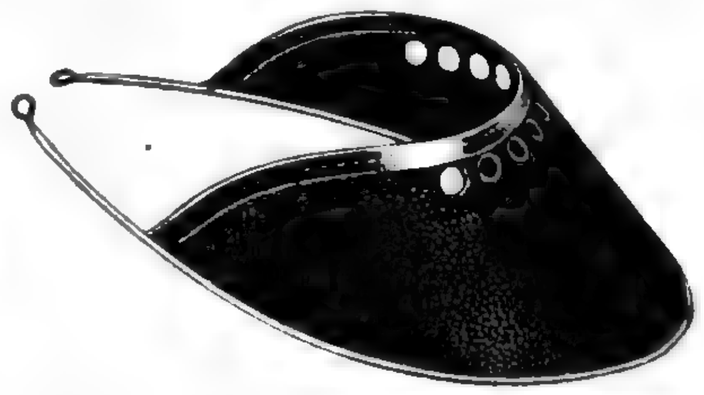
Quality Beyond Question Since 1864

Digitized by Google Original from THE OHIO STATE UNIVERSITY

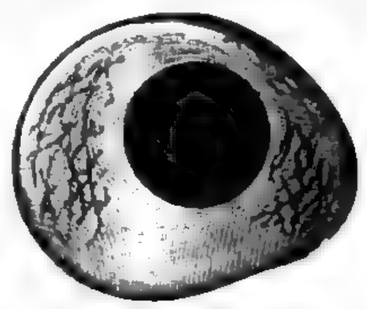


Automatic Eyeglass Chains.

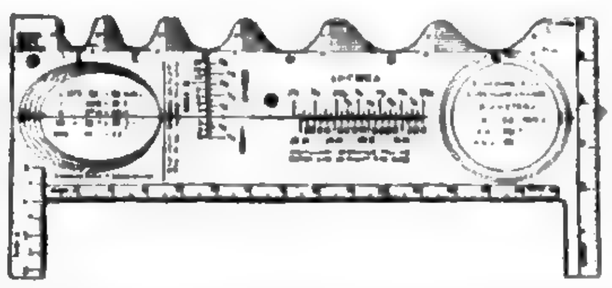




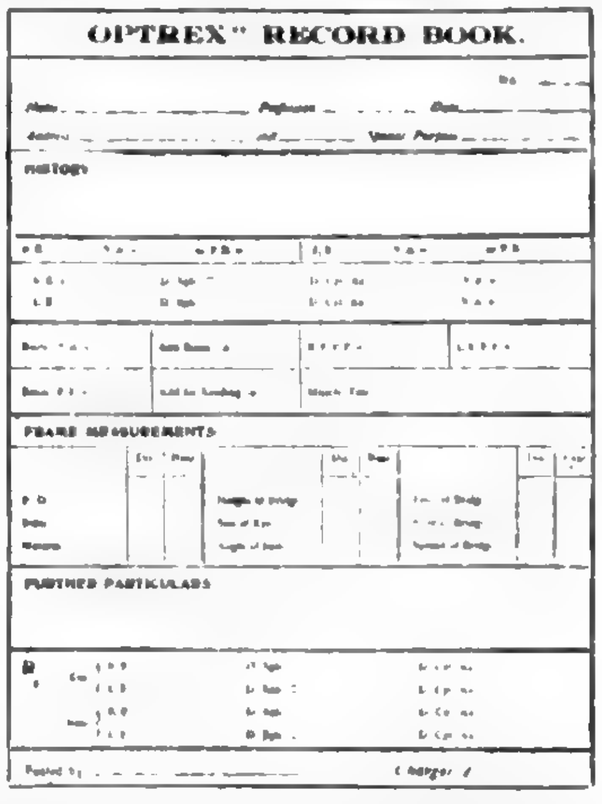
Eye Shades and Reading Shades in Great Variety.



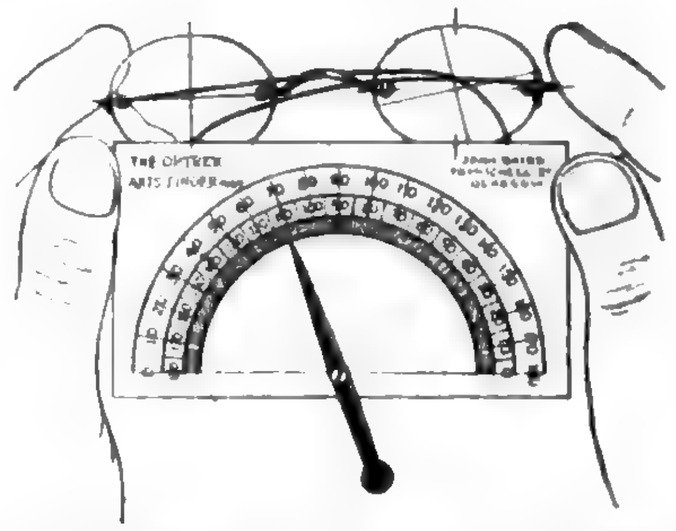
Artificial Eyes, Snellin or Shell at moderate prices. Samples and quotations on application.



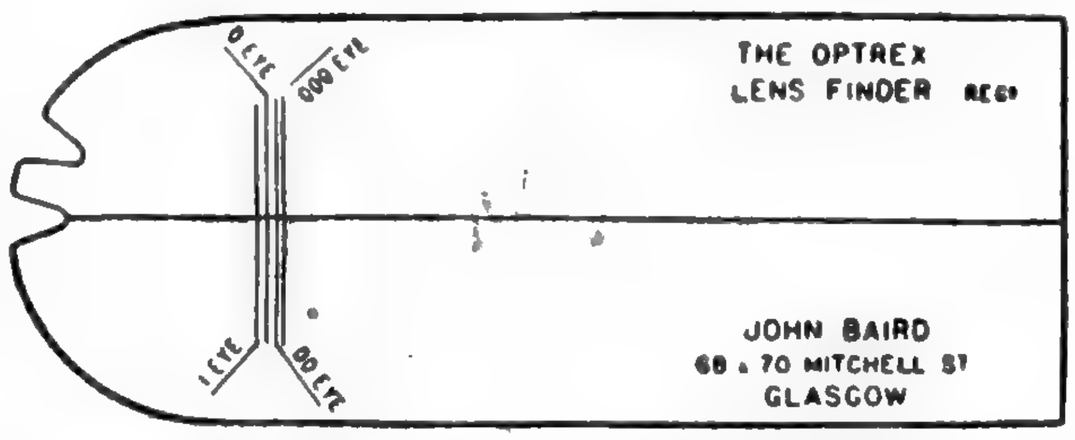
The 'Optex' Rule for Facial and Frame Measurements. The only Rule combining all necessary measurements for either ordering or checking Rx work. Made in Aseptic Ivorine only. Handy size for pocket 7¼ x 3½ in. **10/6** in case or **9/6** without. Complete with instructions (illustrated)



The "Optrex" Record Book. No. 101 containing 500 Record Forms with full details for each test, quarter bound with index and title page, 7s. each. No. 102 ditto, but contains 250 forms, 5s. each. Postage extra.

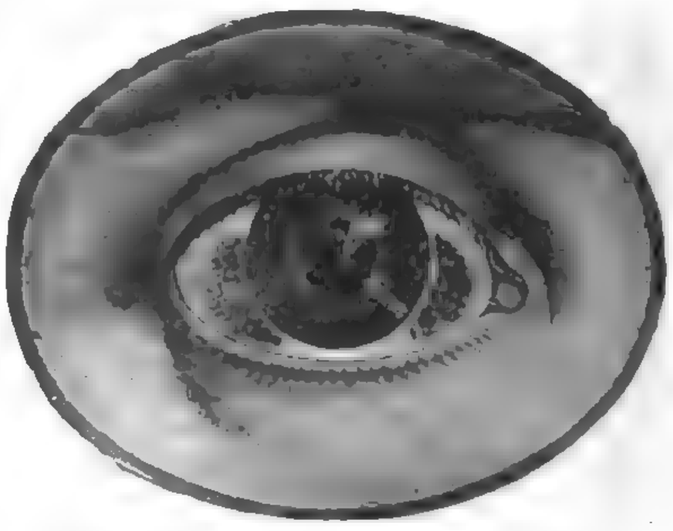


The "Optrex" Axis Locator for quickly finding the axis of plano cyl. or sph. cyl. lenses. Price 5/6 each. Post Free.



(Exact size. Made in Transparent Celluloid.)

The "Optrex" Lens Finder for Rimless Eyeglass Mounts. It enables the optician to stock and fit the actual mount which is to be glazed for his client, giving the correct size lens for the P.D. Price 1/3 each. By post 1/5 each.



Translucent Eyes for Windows and Show Cases, in 3 sizes.

6 x 4½ ins.	...	...	1/9
12 x 9½ ins.	...	...	3/-
18 x 13¾ ins.	...	...	9/-

per pair. Postage 3d. extra.





The "Optrex" Case Labels. Round or Oblong, printed complete with any name and address 8/3 per 1,000

R (Standard Notation) **L**

		SPH.	CYL.	AXIS	SPH.	CYL.	AXIS
DST							
RDG							

The "Optrex" Rubber Rx. Stamp.

3/9 each. By Post 3/11.

Very useful for rough records and post card orders.

JOHN BAIRD,

Manufacturing Optician,

Telegrams: "SPECTACLES, GLASGOW."

"HERALD" OPTICAL WORKS,

68 & 70, MITCHELL ST., GLASGOW.

Telephone: CENTRAL 541.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

D.B.O.A. and F.S.M.C.

Tuition by post under Expert Tutors. Courses for Diploma Examinations. Short period classes before each examination are given at Manchester. Residence provided.

Apply for particulars to Secretary,

PENNINGTONS, University Tutors, 254, Oxford Road, Manchester.

DIXON & HEMPENSTALL,

Wholesale and Manufacturing Opticians,

12, SUFFOLK STREET, DUBLIN.

Telegrams "Optics, Dublin."

OPHTHALMIC AND SCIENTIFIC

MOULDINGS

Supplied in any Curvature and Glass.

CROOKES A SPECIALITY.

REYNOLDS & BAILEY, 15-19, VINE ST.,

LONDON, E.C.1

PERCY S. DE SAULLES.

Manufacturer of . . .

MICROSCOPICAL GLASS SLIDES.

Micro Cover Glasses, Glass Cells and Cavity Slips, etc.

The Platts, Amblecote, Stourbridge.

The SEPTEMBER issue of our

SECOND-HAND CATALOGUE

comprising about 2,5000 Optical, Scientific and Photographic items (all guaranteed perfect) is just out.

WRITE TO-DAY FOR A COPY, POST FREE.

G. BAKER HIGH HOLBORN LONDON

Estab. 1765

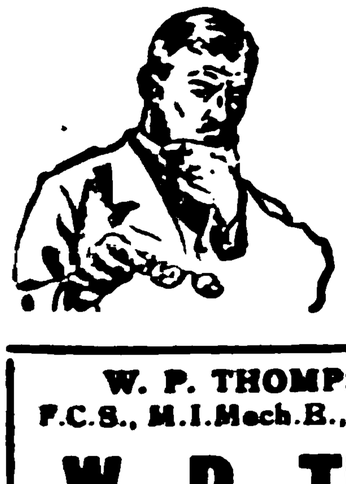
T. WHEELER,

Scientific Instrument Manufacturer,

Specialities: POCKET SURVEYING and ABRONAUTICAL ANEROIDS.

217, GOSWELL ROAD, LONDON, E.C. 1

ESTABLISHED 1878 **TELEPHONE CITY 419**



OPTICAL BLOCKS

To illustrate all features of Optical Service. Write for Lists.

Chemists' Design Service,

12, Humberstone Gate, Leicester.

W. P. THOMPSON. **F.C.S., M.I.Mech.E., F.I.C.P.A.**

S. C. DYMOND. **M.I.Mech.E., F.I.C.P.A**

W. P. THOMPSON & CO.,

12, CHURCH STREET, LIVERPOOL.

Chartered Patent Agents.

H. E. POTTS. **B.Sc., Hon. Chem., F.I.C.P.A.**

J. V. ARMSTRONG. **M.T.I., F.I.C.P.A.**

ARE YOU PUSHING

Chance's A2 Crookes?

We are. It is increasing our sales and bringing new customers.

Let us send *you* samples.

Show it to *your* clients.

Increase *your* sales.

Send for the W.O.W. price list.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY: DUDDEN HILL LANE, N.W.10

THE MARK OF

QUALITY AND E **RELIABILITY**

ELLIOTT'S

Revised

Rx Price List

on application to

Elliott Optical Co.,

104 & 105 GT. SAFFRON HILL,

LONDON, E.C.1

Elliott's Rx Service is What You are Looking for.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

WANTED, old ophthalmometer, need not be in order. Box 3474, c/o "The Optician," 125, Fleet Street, E.C.4.

FOR SALE. Half-plate stand camera, mahogany, 10" ext. Beck-Steinheil Unofocal Ser. 1., No. 5. f/6 with Beck Celverex shutter, T,B to 1/80 sec, 3 mahogany double dark slides, stand, focusing cloth, waterproof case. Offers, lot or separately. Also ¼-plate Holborn reflex, magazine 12, Hex. R.R. f/77. T and I to 1/100 sec. Leather case. Offers. On appro. on deposit of agreed price with the Publishers of "The Optician." Please address, Box 3475, c/o "The Optician," 125, Fleet Street, E.C.4.

SECOND-HAND trial case for sale, cheap. Box 3477, c/o "The Optician," 125, Fleet Street, E.C.4.

FOR SALE. Trial case: Fits-U fitting set: Lens measure: Retinoscope, etc. All as new. Bargain. Beavan, Cheveley, Cambs.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

SIGHT-TESTING business for sale, South East Coast. Established business, oculist and clinic connection. Average takings 1918-19-20 £936 per annum. Could be doubled. Rent £50. 10 years' lease. Offers to Box 3476, c/o "The Optician," 125, Fleet Street, E.C.4.

SIGHT-TESTING (small). Freehold, yielding to £175, both £1750. Hart, 36, Childerbert Road, Balham.

PARTNERSHIP wanted in sound optical business Western district. 13 years' West End experience. Reply, W.V.W., 122, Manor Road, N.16.

SIGHT-TESTING Business wanted. Trade immaterial, if position good. Write, H. Bevan, 8b, Richmond Parade, East Twickenham.

Employment Bureau. *Concluded from page 6*

SHELL spectacle maker. All round situation required. Write S. Clarke, 37, Millais Road, Leytonstone, E.11.

POSITION wanted by qualified assistant, capable of taking charge. Within 20 miles Walsall preferred. Box 5674, c/o "The Optician," 125, Fleet Street, E.C.4.

SPECTACLE lenses can be made in mass to show a profit. I am prepared to open a factory for you on small outlay, or shall I run your plant and increase output or quantity? Apply, Box 5675, c/o "The Optician," 125, Fleet Street, E.C.4.

TURNERY WORK
IN
EBONITE

Small turnery work of all kinds undertaken. Rod and Sheet supplied in any quantity, cut to order. Enquiries Solicited.

BURGE, WARREN & RIDGLEY LTD.
91 & 92, GT. SAFFRON HILL, LONDON, E.C.1

THE REPAIRING OPTICIAN
By JOSEPH FRAY, *Practical Optician.*
F'cap. 8vo (6¾ + 4¼). Cloth.
110 Figures. pp. vi + 183. 8/6 net. Post Free 8/10.
¶ This book is intended to help beginners, apprentices and amateurs to overcome many of the smaller problems for the solution of which they might look to larger text-books in vain. The subjects dealt with include tools; the making and tempering of small tools; frames; repairs; rimless lens mounting, and lenses.
HENRY FROWDE, HODDER & STOUGHTON,
The Lancet Building, 1 & 2, Bedford St., London, W.C.2

BLUE GOLD
Well hardly that, but we can do White or Yellow.
Write for samples and Prices. Rimmed and Rimless. Style and finish guaranteed.
IT WILL PAY YOU.
HAMPTON OPTICAL CO., Ltd.,
28, ESSEX STREET, BIRMINGHAM.

Worshipful Company of Spectaclemakers.
Tuition for the Company's Examinations in Optics and Sight Testing at THE SCHOOL OF OPTICS Ltd.
2, GUILFORD PLACE, LONDON, W.C. 1
Particulars on application.

The Optician's Handbook.
Price 4s. 0d. Post Free.
An elementary text book required by every student of Optics.
It is an introduction to "The Study of the Refraction of the Eye, its Anomalies and their Estimation and Correction by means of Glasses.
The Hatton Press, Ltd.,
125, Fleet Street, LONDON, E.C.4

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Prefix is alright but what really counts is

THE SUFFIX

Crookes glass dates back to say 1913, and made by anyone is original and genuine, but it is important to remember that applies only to Sir Wm. Crookes A and B Glass. Since that date much water has flowed under London Bridge and Sir William only ceased his labours when he brought out his *Ultimate* Glass—the result of his long years of research. The only genuine Crookes Ultimate is made by—

SIR WILLIAM CROOKES ULTIMATE ANTI-GLARE GLASS CO., LTD.,

30, WIGMORE STREET, LONDON, W.

REMEMBER THE SUFFIX—ULTIMATE.

FINEST
ROUGH CYLINDER BLANKS,

Also good 2nd Selection
A very attractive proposition for Export and cheaper work.

CHANCE'S GLASS USED.

ACTUAL MANUFACTURERS
ASSOCIATED OPTICAL WORKS, Ld
5, Queen's Buildings, London, W.1
Near Tottenham Court Road.
No Connection with any other Firm. Telephone: Museum 2216.

Canadian Goggles.

American Styles, made in Canada to supply demand for British goods. A full line of colored lensed goggles in metal and zylo frames, with and without leather, metal and collapsible dust shields for motor, motorcycle, all out-doors, all industrial uses.

Send for Catalogs or Samples.

CANADIAN GOGGLE Co.,
Manufacturers,
37-39 King William St., HAMILTON, ONT.

C. SWAIN, Ltd.,
51, Strand, London.

A B C Code 5th Ed.
'Phone:—GERRARD 5179. Factory: FOREST GATE.

UNCUT
Sphs
Sph Cyls
Piano Cyls

A.O.C. EDGED
Peris & Bi
Cx & Cc etc.,

at Best Prices.

Canadian **FUSED BIFOCAL LENSES** in either finished, semi-finished or rough are the **FINEST MADE** barring none, and they can be had for very **MUCH LESS.** It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,
DANDURAND BLDG., MONTREAL.
Cable "Optical" A.B.C. Code 5th. Edition.

BRITISH OPTICAL INSTITUTE, LTD.,
(College of Optics).

Complete Training for the Sight-Testing Optician.

In addition to the usual Daily Classes and Correspondence Courses, there will commence shortly a series of Special Evening Classes, for those de irous of preparing themselves for any of the Optical Examinations.

A further series of Weekly Evening Lectures, and Demonstrations, for candidates for the F.B.O.A. Examination, and for post-graduates, has also been arranged.

Vacation Classes.

From July to October a series of Vacation Classes will be held for those who wish to widen their knowledge—not necessarily with a view to sitting for any examination.

The whole work of the Institute is carried out under the supervision of the Principal, assisted by Mr. G. W. Colebrook, F.B.O.A., F.S.M.C., (Master's Prizeman).

For full particulars apply to:—The Principal, Dr. MAX COGUE, B.Sc., Fern Lodge, 20a, Grove Road, Brixton, S.W.9
Telephone: Brixton 677.

TO LENS MANUFACTURERS

For Disposal (In Perfect Condition)

1 12 Spindle Machine for Bi & Cy/L Lenses
1 20 „ „ „ Meniscus „
1 10 „ „ „ Deep Bi, Peris & Meniscus Lenses

Together with Blocks. Also a large quantityof White Blanks (Ovals and Rounds), And Dropped Blanks.

Full particulars on application to Box 3454, c/o "The Optician," 125, Fleet Street, E.C.4

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

***A.*—Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

QUALIFIED Optician required as manager. Apply, stating age and experience to G. C. Bateman, 5, Chobham Road, Woking.

MANAGER wanted. North of England. Experienced, good tester. O & S, Qualified. Reply giving full particulars, salary etc. to Box 5672, c o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. desires position with good optician, London preferred. Good appearance and has good photographic experience. Age 24. Apply, Box 5671, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. 30 years of age, with 12 years' pharmacy experience, requires position with optician or chemist-optician. Good salesman and good references. Box 5670, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN with thorough experience of sight-testing and photography, requires position. Entering B.O.A. exam. in November. Age 28. Box 5669, c/o "The Optician," 125, Fleet Street, E.C.4.

"ONLY in experience is there truth (Kant)." Manager, qualified, 12 years' experience desires permanency. Box 5668, c/o "The Optician," 125, Fleet Street, E.C.4.

TECHNICAL assistant, disengaged, requires position. Scientific instrument trade or otherwise, 12 years' general experience. Would consider representation or showroom. Box 5673, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, situation as first-class all round gold worker and jobber. Good references. Address Box 5667, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, smart assistant, age about 21 for City branch. Young man just gained his certificate preferred. Eastern Optical Co., 27, Romford Road, Stratford, E.15.

WANTED, two competent refractionists used to management. Apply Heaton Caflin, 23, Chapel Street, Edgware Road, N.W.1.

LADY Refractionist, qualified, requires post, fully experienced. North preferable. Box 5658, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION required by young man, 28, as manager or first assistant, 10 years' experience. Good salesman. Capable in all cases of refraction, both S. & O. Apply, Box 5666, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUTH, age 18, just left school, passed senior Oxford Local Examination, 1920, desires apprenticeship with good class optician. Midlands preferred. Apply, T. J. Boulter, 82, Barbourne Road, Worcester.

SIGHT-TESTING optician, extensive experience, good retinoscopist and salesman, thoroughly practical and reliable, disengaged. Reply, Optician, 49, Hazlewood Avenue, Newcastle-on-Tyne.

TRAVELLER, optical, with connection on South ground seeks engagement. Box 5661, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION required by sight-testing assistant (22). Capable and careful refractionist, well experienced. Small repair work. Good salesman. Disengaged. London preferred. Studying November's S.M.C. J., 4, Upper Tulse Hill, S.W.

PARALLEL Plate, prism and lens surfacer requires situation, 7 years' first-class experience. Sparke, 49, Manbey Grove, Stratford, E.15.

F.S.M.C. first-class salesman, until recently manager of one of the largest retail shops in London, is open to accept appointment in a business that is capable of increase and would be willing to receive remuneration by results, or would consider investment of £500 to £1,000. Partnership or otherwise. Write, H. Bevan, F.S.M.C., 8b, Richmond Parade, East Twickenham.

YOUNG Lady seeks position in retail optician's. Thoroughly experienced in all prescription work, checking, measuring, fitting, adjusting, knowledge of glazing, drilling and rimless fitting. Several years' West End experience London, provinces, or would consider offer abroad. Box 5659, c/o "The Optician," 125, Fleet Street, E.C.4.

WATCHMAKER-OPTICIAN. A provincial firm of jewellers have a vacancy for a good all-round man as assistant manager, must be reliable watchmaker and efficient tester, progressive position. State age, wages required to Box 5665, c/o "The Optician," 125, Fleet Street, E.C.4.

SCIENTIFIC and Mechanical engineer requires situation, home or abroad. Thoroughly experienced in all optical instruments and machines. Capable draughtsman designer. Box 5662, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, work for small engineering and drawing office concern. Optical instruments and machines a speciality. Box 5663, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED optician with expert knowledge of general optical instruments and microscopes desires post as manager. Box 5655, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED assistant wishes appointment. Midlands preferred. Box 5657, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Lady for optical workshop, experienced in neutralising, bevel and rimless edging and fitting. State experience and salary required to Box 5652, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. D.B.O.A., seeks London engagement, 6 years' workshop and consulting room experience. Accustomed to checking and general supervision. Apply, "Toric," 59, Eden Street, Kingston-on-Thames.

REFRACTIONIST, 33, tall, smart appearance, with long sight-testing and practical experience (London and Provincial) requires situation as branch manager or assistant, excellent references. West of England or South Wales preferred. "Trolos," 22, Toronto Road, Horfield, Bristol.

FIRST-CLASS Rimless fitter seeks situation, edging and bifocal worker. Age 21. Wholesale and retail experience. London or suburbs preferred. Box 5647, c/o "The Optician," 125, Fleet Street, E.C.4.

GLAZIER (Male), requires job or would be useful at shell work, etc. Apply, P., 20, Compton Buildings, Goswell Road, E.C.1.

FIRST ASSISTANT (24), 9 years' experience wholesale and retail, requires situation with good class firm. Smart salesman, reliable tester, and conscientious worker. Used to taking full charge. Wide experience in oculists' prescriptions. Would consider good wholesale position London or suburbs preferred. Excellent references. Disengaged Sept. 30th, 21. Box 5648, c/o "The Optician," 125, Fleet Street, E.C.4.

JUNIOR (D.B.O.A.) seeks position in good house (Liverpool or district preferred). Good refractionist, all repairs, mounting and soldering. Smart address. 5 years' experience. Disengaged early October. Box 5651, c/o "The Optician," 125, Fleet Street, E.C.4.

ADVERTISER, 36, requires permanency, 12 years' experience Optical Instrument trade, spectroscopic and experimental work, chemistry, etc. Moderate salary for good opportunity. Box 5656, c/o "The Optician," 125, Fleet Street, E.C.4.

Concluded on page 6.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE MIDGET



OPERA GLASS.

(Actual size of Illustration.)

Perfect Interpupillary Adjustment.
Superior Lenses.

Claims immediate attention and commands ready sale.

Choice variety:—BLACK MOROCCO, GILT, FANCY LEATHER, PEARL, etc.

WRITE FOR SAMPLE.

R. ARCHER & SONS, Ltd.,

1, AMWELL STREET, LONDON, E.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

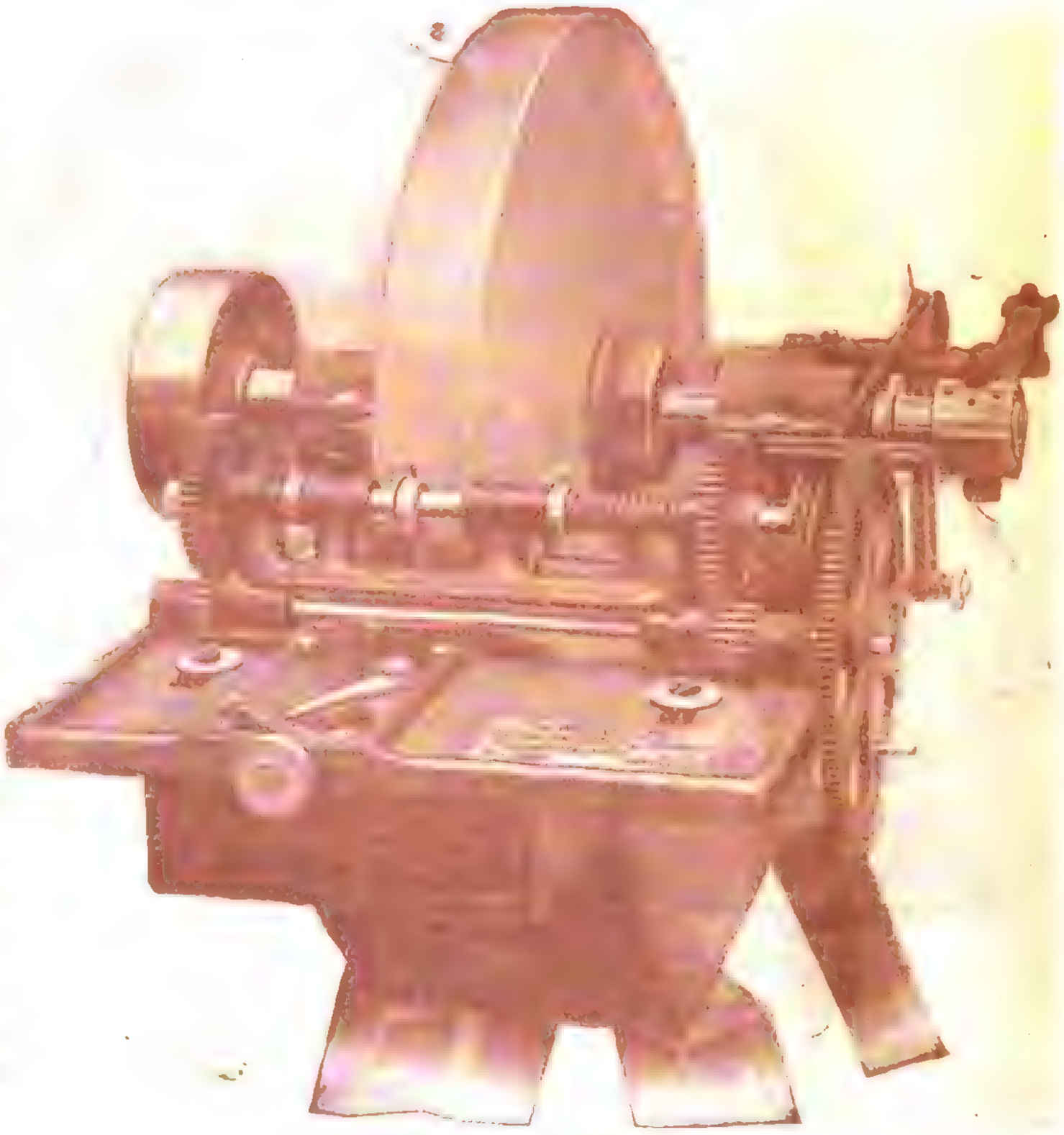
AMERICAN OPTICAL COMPANY, LIMITED.

WORCESTER AUTOMATIC RIMLESS EDGING MACHINE.

This machine possesses many desirable features which particularly adapt it for prescription work in busy shops. Its principal feature is extreme simplicity in construction and operation. Its design is such that any wear on bearings in no way affects the shape of the Lenses being ground.

The price of the Machine is the same with or without legs, although the latter makes a difference in weight with corresponding reduction in freight charges.

Immediate delivery from stock can be made of the above Machines.



M. 73. Complete with legs.

M. 74. Without legs for bench use.

WELLSWORTH

TRADE (A) MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd. at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C.4. (Printed by The Century Press, Fulham.) Sep. 23, 1921.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1592 FRIDAY, SEPT. 30, 1921.

ROSS LENSES AND BINOCULARS.

There are no finer instruments obtainable than Ross Lense and Ross Stereo Prism Binoculars. The name of Ross is a guarantee of their quality.

A generous supply of advertising literature and showcards is supplied to all Ross dealers.

Send for our new catalogues and terms.

ROSS Ltd., Clapham Common, LONDON, S.W. 4

ELLIOTT'S Rx Price List

shows

Substantial Reductions.

High standard of work fully maintained—
Perfectly satisfactory service in all ways
Write for New List and Complete Set
Stationery which will be sent free of charge.

104/5. GT. SAFFRON HILL. E.C. 1



ARCHER LORGNETTES

IN GOLD AND TORTOISESHELL
WITH THE AMWELL STREET FINISH

R. ARCHER & SONS, Ltd.,
1, Amwell Street, London, E.C.1

Reg'd at the G.P.O. as a newspaper PRICE 4d Subscription post free 12 months 17s
Postage in United Kingdom 1d

Digitized by Google Original from THE OHIO STATE UNIVERSITY



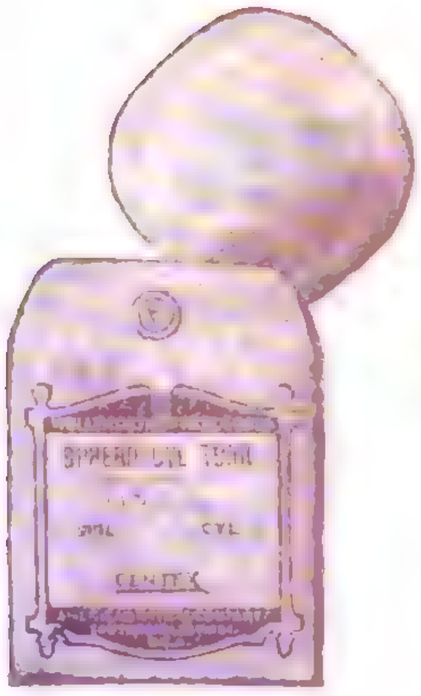
Your Shop Man Appreciates Quality and Service.

That is why every up-to-date prescription shop insists upon having

WELLSWORTH TORIC LENSES

because when it is edged and mounted its surface finished is superior to that of any other toric lens.

You can depend on Wellsworth finished torics because each one is carefully centered and inspected.



Wellsworth Finished Toric Lens

AMERICAN OPTICAL COMPANY, Ltd.,

39, HATTON GARDEN, E.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

GEORGE CULVER LTD

Manufacturing Opticians,

JOBBING AND PRESCRIPTION WORK

ACCURACY,

NEATNESS,

PROMPTNESS

Large and full stocks of English made Lenses of all combinations. Orders can be executed promptly.

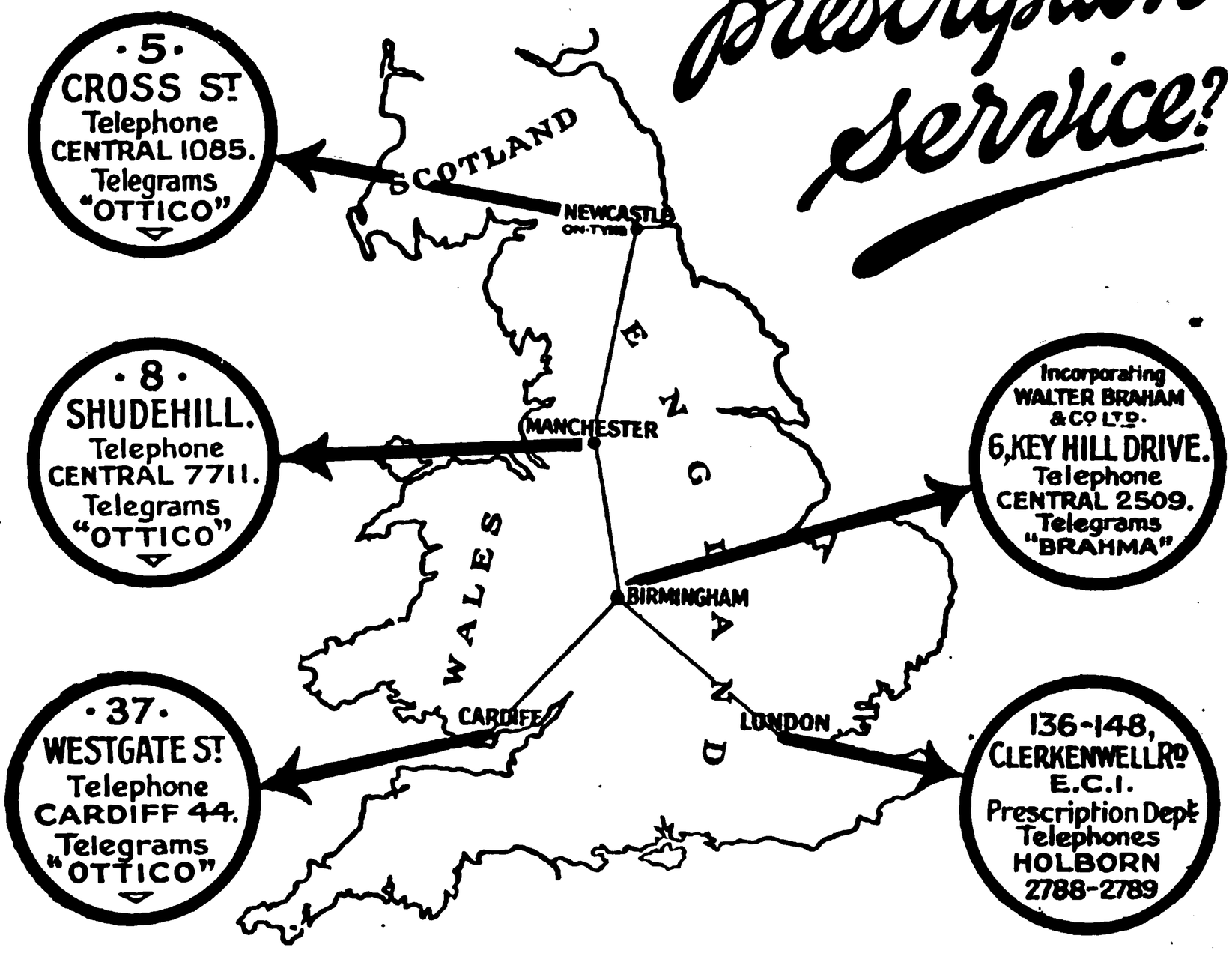
OPTICAL WORKS:
WHITE LION STREET,
PENTONVILLE,
LONDON, N. 1

TELEPHONE:
NORTH 369 and 871

Digitized by Google Original from THE OHIO STATE UNIVERSITY

J&R.F.LTD

Why not link yourself with our prescription service?



Each Branch has a Complete Prescription Equipment.

LINK QUALITY SERVICE BRAND
Reg[d] Trade Mark.

J & R. Fleming Limited.

136-148. Clerkenwell Road, LONDON, E.C.1.

Telegrams: "OTTICO" SMITH, LONDON.

J&R.F.LTD

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
Col. & Ald. Sir CHARLES C. WAKEFIELD, Bt., C.B.E.

Upper Warden
The Rt. Hon. VISCOUNT HILL.

Renter Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Director of Examinations
The Rt. Hon. Sir WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS

of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., on Oct. 31st, 1921, and during the first week in November.

Last date for Entries, Sept. 30th.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT·MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,592

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices
123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, SEP. 30, 1921.

An Important Meeting.—The Thomas Young Oration will be delivered to the Optical Society at 7.30 p.m., on October 13th, at the Imperial College of Science and Technology, by Dr. Charles Sheard, of the scientific staff of the American Optical Company, whose subject will be "Some Physical and Physiological Relationships between Radiant Energy and the Visual Apparatus and Processes." In the following week, Dr. Sheard will deliver the William Ettles Memorial Lecture before the Institute of Ophthalmic Opticians; and later he will address members of the British Optical Association in London and Manchester, and of the Scottish Optical Association in Glasgow.

* * *

Official Meddling in Trade.—Government interference in the operations of trade is strongly resented by the vast majority of traders. As everyone admits, it was necessary during the War—a quite necessary evil. But after November, 1918, we needed no more of it; and so loud was the demand for all restrictions to be abolished that one feels surprised the Government sacrificed so much popularity as they did, just to gratify the desires of their army of bureaucrats. There is one direction only in which governmental interference in commercial affairs can be viewed with a more or less friendly tolerance. That is, of course, in the collection of revenue. The machinery of the income tax and the excise has to be accepted as a necessity, however unwelcome. The Customs organisation has to be maintained also for the collection of indirect taxes, which many people think ought

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

to bear a higher proportion than they do to the direct ones. Here, in the Custom houses, there is profitable occupation for a great number of worthy men of quite modest attainment in education and intelligence. And if the tariff enthusiasts had their way (a letter from one of them is printed this week), some considerable extension of this much more than self-supporting branch of "officialdom" would be made.

* * *

Tariffs to Rectify Exchange.—The scheme particularly referred to by our correspondent, "Sigma" is an import tariff varying according to the country of origin of the goods taxed, and fixed from time to time by proclamation, in agreement with the current rate of exchange. It would be necessary that the tax should be refunded in case of the export of the goods; and anyhow there could be nothing better than a rough approximation to correcting the evils of an adverse exchange, because the rates vary from day to day, while it is obvious that duties must be decided on and defined months ahead, if business is not to be impeded. No doubt the proposal advocated by our correspondent and those who think with him, is aimed primarily against the imports from the ex-enemy countries; for with other countries there are commercial treaties in existence which might involve delay before applying any differential import duty. In effect, the adoption of this proposal would be almost prohibitive of imports of manufactured goods from Germany, etc.; and important exceptions would have to be made in favour of products that it is desirable to import cheaply, rather than stimulate production here at an artificially enhanced price. All mineral and agricultural produce—for example, German beet sugar—would fall in this category.

* * *

Controversial Matters.—We see nothing absurd or impracticable in the idea, which has been mentioned and rather perfunctorily discussed in Parliament since it was first put forward in our columns. However, this not being a political newspaper, it is no business of ours to pronounce on how far a collapsed-exchange duty would infringe the canons of Free Trade. No doubt there are many Free Traders and others who would argue that since Germany must export largely in any event, to pay the reparation we demand, it is better that such of her goods as we can use should come directly into this country rather than be forced on the markets abroad to the detriment of our own export trade. An advantage of allowing Germany to establish credits by her exports to South America, for instance, is that we can draw on those credits for our imports of South American foodstuffs. The subject is clearly a very controversial one.

* * *

An extraordinary circumstance, to our way of thinking, is the apathy with which vital economic questions are treated by the public, except only in so far as these questions are exploited to serve the objects of political parties. Many members of the optical trade and—what is more noticeable—some of the trade organisations, have themselves been remiss. There have been many expressions of opinion offered in private, but too little propagandism through the Press. Now that a new principle has been accepted by Parliament in the Safeguarding of Industries Act (printed in this paper on the 9th inst.), steady pressure should be used to get such amendments introduced as may be needed for protecting all branches of our scientific instrument industry. In this connection we refer readers to the letter from Mr. James T. North, thermometer manufacturer, which we published last week.

New Companies.

Robert C. Shirtcliffe & Son, Ltd.—Private Company. Capital, £6,000 in £1 shares. To acquire the business of a pearl handle and scale cutter and general merchant, formerly carried on by F. W. Shirtcliffe, at 104, West Street, Sheffield as "Robert C. Shirtcliffe & Son." The first directors are:—F. H. Shirtcliffe, 7, Swaledale Road, Sheffield (chairman and managing director), Miss E. A. Shirtcliffe and Mrs. S. A. Honey. Registered Office: 104, West Street; Sheffield.

Whitton, Brother & Whitton, Ltd.—Private company. Capital, £3,000 in £1 shares. To take over the business of merchants supplying gold silver and plated jewellery, optical goods, electro-platers' requisites, leather goods, cutlery, and general merchandise, carried on by J. Whitton and J. P. Whitton, at St. John's Lane, Clerkenwell, E.C., as "Whitton, Brother and Whitton." The permanent directors are:—J. Whitton, 24, Beaumont Road, Holloway, N.19., and J. P. Whitton, "Sark," Monkhams Avenue, Woodford Green. Secretary: J. Whitton. Registered Office: 12, 13, and 14, St. John's Lane, Clerkenwell, E.C.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Primary Aberrations of a Thin Optical System*

By T. W. CHAUNDY, M.A., Christ Church, Oxford.

§ 1. It is convenient to understand by a thin symmetrical optical system one in which the thicknesses and the separations of all the constituent lenses are negligible, and in which therefore all the refracting interfaces are to be regarded as possessing a common vertex. Such a system, although it can, of course, be only approximately realised by concrete embodiments, yet, theoretically considered, is characterised by certain properties which entitle it to be looked on as a distinct category of optical systems, simpler than the general optical system. It is this comparative simplicity which makes it a convenient jumping-off ground in any enquiry into the aberrations of optical systems.

I propose in this paper to restrict attention merely to the "primary" aberrations, by which I mean those given by the second approximation where small quantities up to the second order are retained in lengths measured along the axis, and small quantities to the third order in lengths measured transverse to the axis.

The aberrations are supposed analysed by the line-co-ordinate method which I have described elsewhere.[1] Reference will be made to this paper under the symbol C_1. The method relies for its expression of the aberrations on certain optical constants, A, B, C, D, E, F, G, H, I, J, K, L, expressions for which are given for the general optical system in a paper read to the London Mathematical Society in June, 1918.† Reference will be made to this paper under the symbol C_2. It will be convenient to suppose that this present paper is read in conjunction with a copy of the paper C_2, since very frequent quotation of formulæ, etc., must be made from it.

The results of C_2, although, establishing formulæ sufficient for the evaluation of the primary aberration coefficients A, B, ..., K, L, yet present them in a form which a little practical experience shows is very unhandy. The present paper aims to replace them in the case of a thin system by formulæ simpler theoretically and more adapted for actual computation.

§ 2. *Degrees of freedom of a thin system.* For refraction at a single spherical surface from medium μ into medium μ', the vertex of the surface being the origin of both incident and emergent rays, we have

$$\left.\begin{aligned} \mu' m' &= \mu m - (\mu' - \mu)\rho u \\ u' &= u \end{aligned}\right\} \text{to the first order.}$$

[C_2, § 4, (12), (13), and C_2, § 3, (12)].

Here ρ is the curvature of the spherical surface, m, m' direction cosines of incidence and refracted rays, and u, u' their moments about Oz reckoned positive in the sense $y \rightarrow x$.

For a series of refractions at the interfaces of a thin system, which by definition have a common vertex, we take this vertex as common origin and so for a second refraction, again to the first order,

$$\left.\begin{aligned} \mu'' m'' &= \mu' m' - (\mu'' - \mu')\rho' u' \\ u'' &= u' \end{aligned}\right\}.$$

Evidently then at the end of n refractions we should have

$$\left.\begin{aligned} \mu_n m_n &= \mu m - u \Sigma (\mu' - \mu)\rho \\ u_n &= u \end{aligned}\right\}.$$

But in the notation of C_1 and C_2 we should have written

$$\left.\begin{aligned} m_n &= Pm + Qu \\ u_n &= Rm + Su \end{aligned}\right\}.$$

Thus for any thin system

$$\left.\begin{aligned} &P = \mu/\mu_n, Q = -\{\Sigma(\mu' - \mu)\rho\}/\mu_n \\ &R = 0, S = 1 \end{aligned}\right\} \quad \ldots (1).$$

These equations satisfy of course the fundamental identity $PS - QR = \mu/\mu_n$.

For $(\mu' - \mu)\rho$ we may write κ, the power of the surface ρ, giving

$$Q = -(\kappa_1 + \kappa_2 + \ldots + \kappa_n)/\mu_n = -k_n/\mu_n \ldots (2),$$

where k_n‡ denotes the power of the system comprising the first n surfaces. These are, of course, the standard first-order formulæ of a thin system.

Evidently the systems obtained by stopping short after any $n - k$ of the foregoing refrac-

[1] 'Philosophical Magazine,' vol. xxxiv., December, 1917.

† Series 2, vol. xix., part 1, pp. 30-50.

* From the 'Messenger of Mathematics,' No. 598.

‡ The usual capital K is already required among the aberration coefficients.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

tions are also thin systems, and so characterised by the property $R=0$. Reference therefore to the subsidiary systems in terms of which the formulæ of C_2 § 2 (end), are expressed shows that R vanishes for every such subsidiary system.

It follows from the first, second, fourth, and fifth of these formulæ that

$$AR-PG=0,$$
$$AS-QG=0,$$
$$CR-PI=0,$$
$$CS-QI=0,$$

i.e. since $PS-QR\neq 0$, we must have

$$A=0=C=G=I \quad \ldots \quad (3)$$

Thus for a thin system the fundamental equations take the form

$$m'=\mu m/\mu'+Qu+\tfrac{1}{2}\{Bu(m^2+n^2)+2Du(mu+nv)+(Em+Fu)(u^2+v^2)\},$$
$$u'=u+\tfrac{1}{2}\{Hu(m^2+n^2)+2\mathcal{J}u(mu+nv)+(Km+Lu)(u^2+v^2)\}.$$

These equations have the form

$$\mu'm'-\mu m=m(u^2+v^2)f(m^2+n^2, mu+nv, u^2+v^2)+u\phi(m^2+n^2, mu+nv, u^2+v^2),$$
$$u'-u=m(u^2+v^2)g(m^2+n^2, mu+nv, u^2+v^2)+u\psi(m^2+n^2, mu+nv, u^2+v^2),$$

where f, ϕ, g, ψ denote polynomial functional forms.

It is not difficult to prove that to *any* approximation the fundamental equations of a thin system have this form.

Substitution from (1) and (3) in the first three identities of C_2 § 1 (21) gives

$$\left.\begin{aligned} H&=1-\mu_0^2/\mu^2\\ \mathcal{J}&=-Q\mu_0/\mu\\ E-QK+\mu_0L/\mu&=-Q^2\mu_0/\mu\end{aligned}\right\} \quad \ldots \quad (4).$$

Substitution in the identities C_2 § 1 (22) similarly gives

$$\left.\begin{aligned} B&=Q-\mu_0^2\pi/\mu\\ D-E&=-Q\pi\mu_0\\ I&=\mu_0^2/\mu^2-1\\ \mathcal{J}-K&=-Q\mu_0/\mu=\pi\mu_0\end{aligned}\right\} \quad \ldots \quad \ldots \quad (5).$$

Further manipulation of (4) and (5) enables us to write for *ten* of the *twelve* aberration coefficients

$A=0,$	$G=0,$
$B=Q-\pi\mu_0^2/\mu,$	$H=1-\mu_0^2/\mu^2,$
$C=0,$	$I=0,$
$D=-\mu_0L/\mu-\mu_0Q^2/\mu,$	$\mathcal{J}=-\mu_0Q/\mu,$
$E=-\mu_0L/\mu-\mu_0Q^2/\mu+Q\pi\mu_0,$	$K=\pi\mu_0.$

Evidently then the primary aberrations are completely expressible in terms of two of their number, say F and L, together with π, the Petzval sum—a fact of course well known. The primary aberrations of a thin system have thus three degrees of freedom: the first order behaviour of such a system is completely expressible in terms of a single optical constant $\kappa_1+\kappa_2+\ldots+\kappa_n$, the power of the system. If we compare these facts with the corresponding facts for the general system, we remember that the first order behaviour of the general system requires three constants for its expression (say k, $\delta k/\delta\kappa_1$, and $\delta k/\delta\kappa_p$, k being the power of the system, and κ_1, κ_p those of the end surfaces). Its primary aberrations possess, as is known, six degrees of freedom. In these facts lies the characteristic distinction of a thin system to which I have already alluded.

Having established that the primary aberrations of a thin system are always expressible in terms of three optical constants, there still remains for us the choice of what three quantities should ordinarily be employed for this duty, a decision evidently of a practical character. Clearly Petzval's sum, π, should be one of the three. It has the merit, not merely of simplicity, but also of being symmetrical with regard to the two ends of the instrument; that is to say, it is unaltered if the n^{th} medium and the $p-n^{th}$ be everywhere interchanged. Such a property (which it is convenient to speak of as "reversibility") also belongs to the first order constant $\kappa_1+\kappa_2+\ldots+\kappa_p$, the power of the system.

Mr. T. Smith, in a paper read to the Physical Society,‖ proposes for his two remaining constants two quantities, of which one is "reversible." I wish to suggest two constants, of which one is reversible, and the other reversible but for a change of sign.

§ 3. *The constant* $D+E$.

One of these two constants is the quantity $D+E$, which I proceed to express in terms of the powers of the constituent surfaces.

From the 10th equation of C_2, § 4 (19.4), we have, since the R of every subsidiary system vanishes, that

$$\mu(ES-QK)=-\mu_0\Sigma(Q_n-Q_{n-1})(Q_n\mu_n-Q_{n-1}\mu_{n-1})/(\mu_n-\mu_{n-1}).$$

But $S=1$, $K\mu_0=\pi=\Sigma\kappa_n/\mu_n\mu_{n-1}$.

Also, from (2), $Q_n=-(\kappa_1+\ldots+\kappa_n)/\mu_n$.

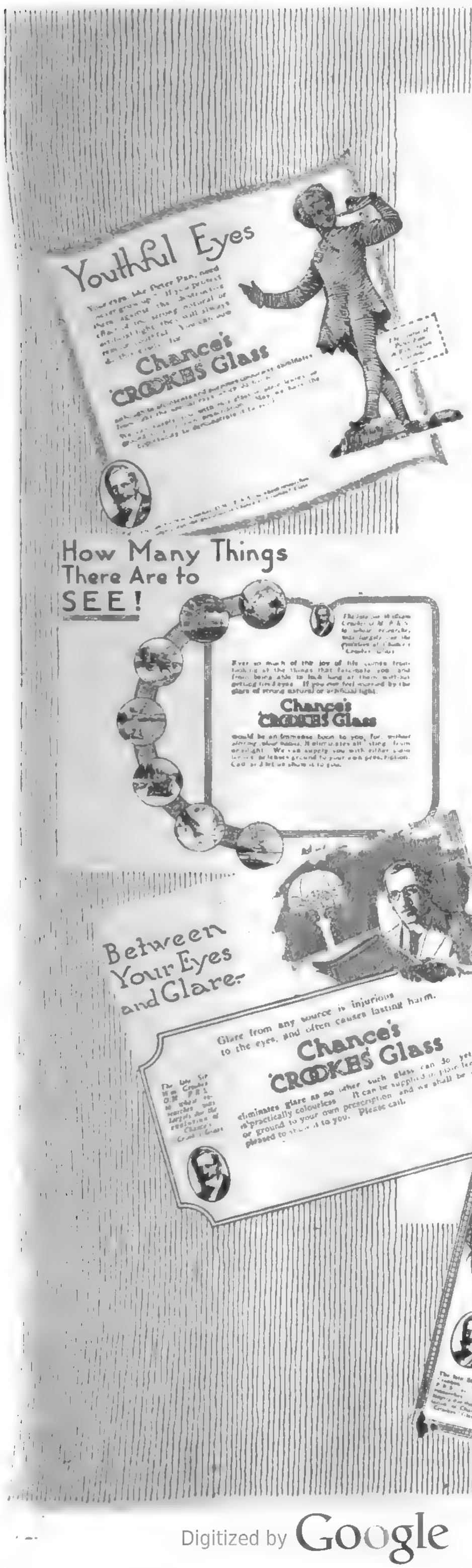
Thus, after reduction,

$$\mu(2E-\mu_0\pi Q)/\mu_0=\Sigma(\kappa_n/\mu_n\mu_{n-1})\{2\mu_n(\kappa_1+\ldots+\kappa_{n-1})-2\mu_{n-1}(\kappa_1+\ldots+\kappa_n)(-\kappa_1+\ldots+\kappa_p)(\mu_n-\mu_{n-1})\}/(\mu_n-\mu_{n-1})$$

‖ Proceedings of the 'Physical Society,' vol. xxvii., p. 495.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY



THE SCHEME

As you may have heard, the local advertising of Chance's "CROOKES" Glass by Opticians is having a great vogue, and is, we understand, resulting in an all-round increase of custom for those who are so advertising. So unflagging have been the requests from Opticians for the blocks that we have offered to supply free, that we have found it worth while to prepare a **special** series of six advertisements for small spaces in local papers. We illustrate them (quarter size) here. Those down the side are 4″ deep by 4½″ (two columns) wide, those at the bottom 4″ deep by 2¼″ (one column) wide. The blocks are complete with illustrations and printed matter as shown, and with a blank space for any extra message you desire to insert. We shall be quite pleased to supply them free to any Optician who sees the possibilities of increased business which lie in

Chance's 'CROOKES' Glass

An Instrument is now on the market to demonstrate to the public the efficacy of Chance's "CROOKES" Glass in cutting off the harmful light rays.

CHANCE BROS. & Co., Ltd.,
Glass Works,
SMETHWICK, BIRMINGHAM.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Shur-on Glasses

Merit

The merit of any product is best proven by the service it renders.

The service record of Shur-on Optical Products dates back to 1864—and is favourably known the world over.

For upwards of half a century the name "Shur-on" has been synonymous with "Quality Beyond Question." The design, construction and workmanship of Shur-on spectacles, eyeglasses, mountings and cases bear the mark of the master craftsman. You will find them a most worthy and profitable addition to your present line. Your wholesaler can supply your needs.

Quality Beyond Question Since 1864

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

$$=\Sigma(\kappa_n/\mu_n\mu_{n-1})\{(\kappa_1+\ldots+\kappa_{n-1}-\kappa_{n+1}-\ldots-\kappa_p)-(\mu_n+\mu_{n-1})\kappa_n/(\mu_n-\mu_{n-1})\}.$$

It is convenient to write

$$\sigma_n\equiv\kappa_1+\ldots+\kappa_{n-1}-(\mu_n+\mu_{n-1})\kappa_n/(\mu_n-\mu_{n-1})-\kappa_{n+1}\ldots-\kappa_p.$$

Also, by (5),

$$2E-\mu_0\pi Q=D+E \quad \ldots \quad (7).$$

Thus

$$D+E=(\mu_0/\mu)\Sigma\kappa_n\sigma_n/\mu_n\mu_{n-1} \quad \ldots \quad (8).$$

§4. *The constant* $2(FP-QD)-\mu_0\pi Q$.

The third quantity which I employ is that just named $2(FP-QD)-\mu_0\pi Q$. To evaluate it we have that

$$(PS-QR)(FP-QD)=P^2(FS-QL)-PQ(FR-PL+DS-QJ)+Q^2(DR-PJ),$$

i.e. by the 7th, 8th, 11th, 12th equations of C_2 § 3 (19*A*),

$$\mu_0(FP-QD)=\Sigma S_n(Q_n/\mu_n-Q_{n-1}/\mu_{n-1})\{P(Q_n-Q_{n-1})-Q(P_n-P_{n-1})\}^2(1/\mu_n-1/\mu_{n-1})^{-2}.$$

But $S_n=1$ and $P_n=\mu_0/\mu_n$ for any thin system.

Thus $PQ_n-QP_n=\mu_0(\kappa_{n+1}+\ldots+\kappa_p)/\mu_n\mu_p$, and

$$P(Q_n-Q_{n-1})-Q(P_n-P_{n-1})=(\mu_0/\mu_n\mu_{n-1}\mu_p)\{\mu_{n-1}(\kappa_{n+1}+\ldots+\kappa_p)-\mu_n(\kappa_n+\ldots+\kappa_p)\}=(\mu_0/\mu_n\mu_{n-1}\mu_p)\{(\mu_{n-1}-\mu_n)(\kappa_{n+1}+\ldots+\kappa_p)-\mu_n\kappa_n\}.$$

Thus

$$\mu^2(FP-QD)/\mu_0{}^*=\Sigma(Q_n/\mu_n-Q_{n-1}/\mu_{n-1})(\kappa_{n+1}+\ldots+\kappa_p+\mu_n\rho_n)^2$$

on reduction.

Re-arranging the terms under the summation this again becomes

$$\Sigma(Q_n/\mu_n)\{(\mu_n\rho_n+\kappa_{n+1}+\ldots+\kappa_p)^2-(\mu_{n+1}\rho_{n+1}+\kappa_{n+2}+\ldots+\kappa_p)^2\}$$
$$=\Sigma(Q_n/\mu_n)\{(\mu_n\rho_n+\kappa_{n+1}+\ldots+\kappa_p)^2-(\mu_n\rho_{n+1}+\kappa_{n+1}+\ldots+\kappa_p)^2\}$$
$$=\Sigma(Q_n/\mu_n)\mu_n(\rho_n-\rho_{n+1})\{2(\kappa_{n+1}+\ldots+\kappa_p)+\mu_n(\rho_n+\rho_{n+1})\}$$
$$=\Sigma Q_n\mu_n(\rho_n{}^2-\rho^2{}_{n+1})+2\Sigma Q_n(\rho_n-\rho_{n+1})(\kappa_{n+1}+\ldots+\kappa_p).$$

Again re-grouping the terms under the signs of summation, the foregoing becomes

$$\Sigma\rho_n{}^2(\mu_nQ_n-\mu_{n-1}Q_{n-1})+2\Sigma\rho_n\{Q_n(\kappa_{n+1}+\ldots+\kappa_p)-Q_{n-1}(\kappa_n+\ldots+\kappa_p)\}$$
$$=-\Sigma\rho_n{}^2\kappa_n+2\Sigma(\rho_n/\mu_n\mu_{n-1})\{\mu_n(\kappa_1+\ldots+\kappa_{n-1})(\kappa_n+\ldots+\kappa_p)-\mu_{n-1}(\kappa_1+\ldots+\kappa_n)(\kappa_{n+1}+\ldots+\kappa_p)\}$$
$$=-\Sigma\rho_n{}^2\kappa_n+2\Sigma(\rho_n/\mu_n\mu_{n-1})\{(\mu_n-\mu_{n-1})(\kappa_1+\ldots+\kappa_n)(\kappa_{n+1}+\ldots+\kappa_p)+\mu_n\kappa_n(\kappa_1+\ldots+\kappa_{n-1}-\kappa_{n+1}-\ldots-\kappa_p)\}$$
$$=+\Sigma\rho_n{}^2\kappa_n+2\Sigma(\kappa_n/\mu_n\mu_{n-1})\{(\kappa_1+\ldots+\kappa_n)(\kappa_{n+1}+\ldots+\kappa_p)+\mu_n\rho_n(\kappa_1+\ldots+\kappa_{n-1}-\kappa_{n+1}-\ldots-\kappa_p)-\mu_n\mu_{n-1}\rho_n{}^2\}.$$

Thus $\{2(FP-DQ)-Q^2\mu_0\pi\}\mu^2/\mu_0$

$$=2\Sigma(\mu_n-\mu_{n-1})\rho_n{}^3+\Sigma(\kappa_n/\mu_n\mu_{n-1})\{4(\kappa_1+\ldots+\kappa_n)(\kappa_{n+1}+\ldots+\kappa_p)+4\mu_n\rho_n(\kappa_1+\ldots+\kappa_{n-1}+\kappa_n-\kappa_{n+1}-\ldots-\kappa_p)-4\mu_n{}^2\rho_n{}^2-(\kappa_1+\ldots+\kappa_p)^2\}$$
$$=2\Sigma(\mu_n-\mu_{n-1})\rho_n{}^3-\Sigma(\kappa_n/\mu_n\mu_{n-1})(\kappa_1+\ldots+\kappa_n-2\mu_n\rho_n-\kappa_{n+1}-\ldots-\kappa_p)^2$$

on reduction. But

$$\kappa_1+\ldots+\kappa_n-2\mu_n\rho_n-\kappa_{n+1}-\ldots-\kappa_p$$
$$=\kappa_1+\ldots+\kappa_{n-1}-(\mu_{n-1}+\mu_n)\rho_n-\kappa_{n+1}+\ldots+\kappa_p$$
$$=\sigma_n \text{ in the notation of equation (3).}$$

For brevity I further write

$$\left.\begin{aligned}\pi_1&\equiv\Sigma\sigma_n\kappa_n/\mu_n\mu_{n-1}\\ \pi_2&\equiv\Sigma\sigma_n{}^2\kappa_n/\mu_n\mu_{n-1}\end{aligned}\right\} \quad \ldots \quad \ldots \quad (9),$$

the notation indicating the dimension in σ and the analogy with

$$\pi\equiv\Sigma\kappa_n/\mu_n\mu_{n-1}.$$

I write also $h\equiv\Sigma(\mu_n-\mu_{n-1})\rho_n{}^3 \quad \ldots \quad (10)$

in analogy with $k\equiv\Sigma(\mu_n-\mu_{n-1})\rho_n$, the power of the complete system. In this notation we have therefore that

$$\left.\begin{aligned}D+E&=2E-\mu_0Q\pi=\mu_0\pi_1/\mu\\ 2(FP-DQ)-\mu_0Q^2\pi&=2\mu_0h/\mu^2-\mu_0\pi_2/\mu^2\end{aligned}\right\} \quad (11).$$

These I propose as the two constants which in conjunction with π should serve as the three fundamental constants in terms of which every primary aberration may be expressed.

Evidently, if we reverse the system, σ_n becomes $-\sigma_{p-n}$; thus π_2 is reversible, while π_1 is reversible with change of sign. By analogy with k it is evident that h is reversible (without change of sign). Hence $2(FP-QD)-\mu_0Q^2\pi$ is reversible, while $D+E$ is reversible with change of sign (except of course for possible factors μ_0 and μ).

The quantity σ_n may be given an analogy with k_n the power of the first n surfaces, or more precisely with k_n-k_n', where k_n' is the power of the last $p-n$ surfaces, which is possibly useful as a mnemonic or otherwise.

The power of κ of a surface is defined as the curvature of the surface multiplied by the difference of the μ's of the media which it separates. Permit ourselves to define λ, the "power" of a *medium*, as its refractive index multiplied by the difference of the curvatures of the surfaces which it separates *i.e.* $\lambda=(\rho'-\rho)\mu$. The end-media of the system we may suppose to have the plane at infinity as one bounding surface, so that

$$\lambda_0=-\rho_1\mu_0;\quad \lambda_p=\rho_p\mu_p.$$

* μ on the left denotes, of course, the same quantity as μ_p on the right.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Then

$$\lambda_0+\lambda_1+\ldots+\lambda_{n-1}=-\rho_1\mu_0-(\rho_1-\rho_2)\mu_1+\ldots+(\rho_{n-1}-\rho_n)\mu_{n-1}=(\mu_1-\mu_0)\rho_1+\ldots+(\mu_{n-1}-\mu_n)\rho_{n-1}-\mu_{n-1}\rho_n=\kappa_1+\kappa_2+\ldots+\kappa_{n-1}-\mu_{n-1}\rho_n.$$

So $\lambda_n+\ldots+\lambda_p=\mu_n\rho_n+\kappa_{n+1}+\ldots+\kappa_p$.

Hence $\sigma_n=(\lambda_0+\ldots+\lambda_{n-1})-(\lambda_n+\ldots+\lambda_p)$,

which is comparable with

$$k_n-k_n'=(\kappa_1+\ldots+\kappa_n)-(\kappa_{n+1}+\ldots+\kappa_p).$$

Since $h=(\lambda_0+\ldots+\lambda_{n-1})+(\lambda_n+\ldots+\lambda_p)$

it is possible to write

$$FP-DQ=\mu_0 h/\mu^2-(\mu_0/\mu^2)\Sigma(\lambda_0+\ldots+\lambda_{n-1})\times(\lambda_n+\ldots+\lambda_p)\kappa_n/\mu_n\mu_{n-1} \quad \ldots \quad (12)$$

The second term on the right does not however seem so convenient as π_2.

We may now write the twelve primary aberration coefficients of the system as

$A=0$, $G=0$,

$B=-k/\mu-\pi\mu_0^2/\mu$, $H=1-\mu_0^2/\mu^2$,

$C=0$, $I=0$,

$D=\mu_0(\pi_1+\pi k)/2\mu$, $J=k\mu_0/\mu^2$,

$E=\mu_0(\pi_1-\pi k)/2\mu$, $K=\pi\mu_0$,

$F=h/\mu-\pi_2/2\mu-k\pi_1/2\mu$, $L=-k^2/\mu^2-(\pi_1+\pi k)/2$.

From these formulæ the primary aberrations can of course be calculated; thus the primary spherical aberrations for an incident parallel beam and semi-aperture y is

$$\tfrac{1}{2}y^2\{2\mu h/k^2-2k/\mu-\mu\pi+2\mu\pi_1/k-\mu\pi_2/k^2\}.$$

Other formulæ given in C., (7) enable the other aberrations of a beam originally parallel to be stated in terms of h, k, π, π_1, π_2.

In particular, it may be remarked that for a stop at $(\xi, 0, 0)$, *i.e.* a distance ξ *beyond* the first surface, the astigmatism is

$$(\mu/\mu_0)^2\{(S\xi-R)(F\xi-D)-(Q\xi-P)(L\xi-J)\}.$$

If the stop is at the incident focus (*i.e.* the focus in the first medium), $\xi=P/Q$, and the astigmatism reduces to

$$(\mu'/\mu)(FP-QD)/Q^2.$$

It is known that this astigmatism is unaltered, except for factors μ, μ_0, by reversal of the optical system. This is corroborated by the result of equation (12) and provides an interpretation of the quantity $FP-QD$. The question may be asked whether a set of six reversible constants (including of course Petzval's sum) can be found for the general system. It is possible to develop a set as follows. The quantity $FP-QD$, it is known, remains reversible for any system (thick or thin). Operation on this with the differential operators $\delta/\delta\kappa_1 \pm \delta/\delta\kappa_p$ (which are themselves reversible with or without change of sign) evidently generates aberration constants, which are reversible with or without change of sign. In this way, a set of five reversible constants can be added to Petzval's sum to serve for the complete determination of the primary aberrations of the general symmetrical instrument. The constants so determined do not however seem to be in as handy a form as could be desired, and it is possible a more convenient set of reversible constants is discoverable. For this reason I have limited the foregoing discussion to the case of thin systems alone.

"SMOKY" QUARTZ.

The deeply tinted varieties of quartz, such as "smoky" quartz and the yellow or Madagascar variety, are generally transparent in the infra-red region of the spectrum to the same extent as clear rock-crystal, as may easily be demonstrated with the aid of a thermopile and galvanometer. I with to suggest (says Prof. C. V Raman in 'Nature,' from which we quote) that a very simple physical explanation of this property may be offered.

As has been emphasised in a paper by Prof. R. J. Strutt (now Lord Rayleigh) in the Proceedings of the Royal Society for 1919, these varieties of quartz are really optically turbid media, the opacity arising from the scattering of the radiations in their passage through the crystal by a cloud of small particles present as inclusions. Since scattering of this kind is effective in inverse proportion to the fourth power of the wave-length, it can easily be seen why the longer heat-waves can traverse the crystal without appreciable loss. Some photometric observations which I have made of the relative transparency of the yellow and colourless varieties in different parts of the spectrum support this explanation.

In the paper just quoted Rayleigh has described the very beautiful and striking effects that arise owing to optical rotatory dispersion when a strong beam of *polarised* light is sent through a block of smoky or yellow quartz in the direction of the optic axis; the track of the beam, as made visible by the scattering particles and observed in a transverse direction, shows bright and dark bands if monochromatic light be used, and alternations of colour if the incident beam is of white light, the effect being due to the fact that the scattering particles themselves act as *analysers* of the light incident on them. I find that the phenomenon discovered by Lord Rayleigh can be very prettily shown in another way which

Digitized by Google Original from THE OHIO STATE UNIVERSITY

W.H.T.

W.H.T.

THE HALL-MARK OF

Efficiency.

Service.

Supplies.

WALTER H. THOMPSON

66 HATTON GARDEN, LONDON, E.C. 1.

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

NORTHAMPTON POLYTECHNIC INSTITUTE,
Clerkenwell, London, E.C.1

DEPARTMENT OF OPTICAL ENGINEERING & APPLIED OPTICS

SESSION 1921-22.

TECHNICAL DAY COURSES

FOR OPTICIANS AND

OPTICAL INSTRUMENT MAKERS.

Whole-time day courses in optical work will commence at the Institute on Monday, 3rd October, 1921. **Entrance Examinations**, 27th and 28th September, 1921. These courses are specially adapted to meet the varied requirements of the optical trade.

Should a sufficient number of students apply for enrolment, day apprentices classes will also be held, each student attending alternate weeks for one week continuously.

EVENING TECHNICAL COURSES

for Opticians and Optical Instrument Makers will be offered, the session, for these courses commencing on Monday, 26th September, with enrolments during the preceding week.

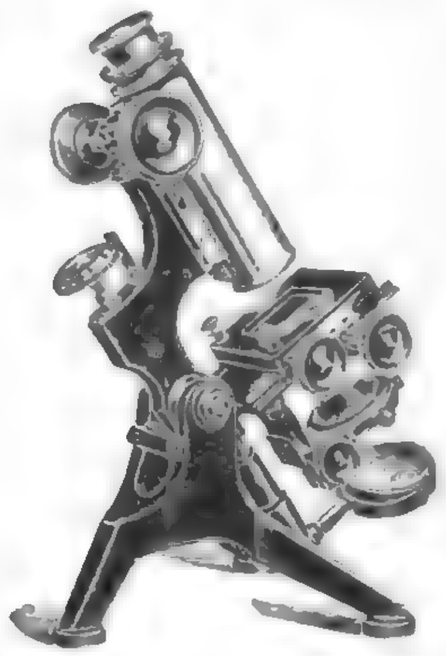
Full particulars as to fees, dates, &c., and all information respecting the above courses and also the Engineering and other work of the Institute, can be obtained at the Institute, or on application to—

R. MULLINEUX WALMSLEY, D.Sc., *Principal*

SELL WATSONS'
BRITISH-MADE

MICROSCOPES

NOW READY



New Catalogues:

Part 1—**Students'** Microscopes.

Part 2—**Research** Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,
313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1837

ROUGH TORIC LENSES

MADE IN CANADA.

If you do your own surface grinding you know how important it is to get rough toric lenses with accurate base curves, and well polished. It is very annoying when finishing a toric lens to find a defect on the toric side. This means a loss of time to you.

Our "Made-in-Canada" rough toric lenses are guaranteed to be of the highest standard of quality. All we ask is for you to send us a trial order. They will cost you no more than those of inferior makes.

Send for our Price List, and allow us to submit samples.

Sold through the Wholesale Trade.

IMPERIAL OPTICAL Co.,

PERCY HERMANT, Prop., and General Manager.

Hermant Building, Toronto, Canada.

NOTE:—It was officially announced that lenses made in the British Empire would be admitted to England, duty free.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

is also instructive.

A thin flat sheet of *unpolarised* white light may be sent through the crystal in a direction *transverse* to the optic axis, and the track of the beam observed in a direction parallel to the optic axis through a nicol. In this case the scattering particles act as *polarisers*, and the scattered light suffers a rotatory dispersion of its plane of polarisation in traversing the quartz along the optic axis before reaching the observer's eye. Hence the whole track of the beam as seen through the observing nicol appears coloured, the tint fluctuating periodically with the thickness traversed as the block is moved to and fro in the line of sight or when the analysing nicol is rotated.

Rayleigh has shown in his paper that the track of a beam of light traversing a beam of *transparent* colourless quartz can be successfully photographed. I find that by using a concentrated beam of sunlight it is possible *visually* to detect the Tyndall blue cone even in this case. Its intensity, however, is exceedingly small.

Hypnotic Suggestion & its Relation to the Refractionist.

By H. F. SPARLING, Member of The National Association of Opticians.

The Press has recently given much prominence to the subject of hypnotism. This is probably due to the revival of a method of treatment eminently suitable for neurasthenics and "nerve" cases generally, the number of which has greatly increased as a direct result of wartime worry, anxiety and experiences.

A prominent American optometrist has given an account of some of his personal researches in hypnotism. He advocates its use by his brother refractionists, as he considers them better fitted than most men to investigate the phenomena, and privileged to experiment along those lines without incurring the displeasure of any section of the community.

May I venture to suggest that the treatment of patients by hypnotic suggestion would be an undesirable "side-line," and would prove unsatisfactory ethically and financially if used in conjunction with optics.

There are many to-day engaged in applying this treatment, some with a measure of success, others with ignominious failure. The number of charlatans engaged in this work has rather tended to bring ridicule and discredit upon those bona fide medical men who have scientifically investigated this branch of therapeutics. Hypnotism is no modern discovery; it has been known since the earliest times, for mesmeric healing was practised among the ancient Egyptians. No doubt certain Biblical miracles may have been of this nature. It is not yet ancient history, since "touching." For the "King's Evil" was believed in, and evidence is abundant that the touch of the Royal hand often worked wonders upon the diseased body through the cheered and uplifted mind. The modern pilgrimages to Lourdes will, of course, occur to the mind of the reader.

The public exhibitions of pseudo-hypnotists which have been given at music-halls, etc., did much to foster prejudice and ignorance among the laity, tending to mislead them, disgracing the science and making it difficult for scientists and physicians to place hypnotism in its proper sphere within the realm of scientific medicine. It has however, arrived to-day within the domain of practical therapeutics, and has through scientific experiment been robbed of much superstition and misinterpretation which surrounded it in the past. The revival of hypnotism in England as a therapeutic agent was mainly due to the writings and teachings of the late Dr. C. Lloyd Tuckey and Dr. Milne Bramwell, of London, after the B.M.A., and Psychical Research Society had submitted it to investigation.

What is Hypnotism?

There are many theories regarding its nature, but what it really is yet remains to be discovered. All authorities agreed that the original emanation theory of Mesmer was erroneous. Dr. Mesmer, a Viennese physician, in 1775 first drew attention to the subject known as animal magnetism and believed that he was able to throw a magnetic emanation into the bodies of his subjects. Attired in a lilac silken gown in a darkened room to the sound of subdued music, he gazed into the subject's eyes, made certain passes and touched the seat of disease with an iron wand. In spite of thousands of wonderful cures, he aroused much opposition among his professional brethren. He went to Paris, demonstrating among thousands and making many converts among continental physicians. German and French doctors enthusiastically took up hypnotism but the Faculty of Medicine

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

(Paris) forbade its use.

Later, scientific commissions reported against the existence of animal magnetism. They could not deny that thousands of cures resulted from the séances but refused to admit that any curative magnetic influence passed from operator to patient. The Prussian Government in 1812, sent Dr. Wolfatt to study under Mesmer and report, which he did and instantly introduced Mesmeric treatment into his hospital. The French Revolution checked Mesmer's progress for some years, so he retired to his native place dying on Lake Constance in 1815.

Abbe Farea, of Paris, revived interest in Mesmerism and published works in 1819. He showed that the phenomenon was not to be attributed to any special force in the mesmerist, but to a changed condition in the subject himself. In 1837, Dr. Elliotson of London, was attracted to and introduced mesmeric treatment into his hospital and although meeting with much ridicule, contempt and even abuse from his colleagues, undaunted he pursued his way until the Hospital Committee forbade its further practice there. Elliotson resigned forthwith but in 1846, delivered the Harvian Oration, making Mesmerism the subject of his address.

In 1842, Dr. Braid, a Scotsman, investigated the science and concluded it was subjective in origin and due to a changed mental state produced on the subjects themselves, brought about by a condition of increased receptivity to the suggestion of the operator. Hence he introduced the name hypnotism—nervous sleep, and he thought that no mysterious magnetic fluid passed from operator to subject—a conclusion confirmed by and agreeing with Faria, Eskdaille, Elliotson and others. Dr. Braid's works were translated and hypnotism received serious attention among continental physicians. Braid died in 1860, greatly respected even by those of his professional brethren, who were opposed to his views. No doubt he was the means of raising hypnotism as a remedy in certain diseases, to a position it had never previously held in the eyes of the medical profession.

The Psychological Research Society hold the view that man is a dual being having two states of consciousness, the conscious and the subconscious mind, and that during hypnosis the reasoning, analytical faculties of the waking consciousness are temporarily placed in abeyance while the whole nervous force of the subject is concentrated upon the single idea suggested by the operator. Others assert that the nerves connecting the high intellectual centres with the lower sympathetic centres are paralysed during hypnosis.

There are different stages of hypnosis.

Stage I. Slight: Simple drowsiness, the subject being conscious of all that occurs and can recall it later.

Stage II. Deep: Subject sleeps and cannot recall what took place upon waking, but if re-hypnotised can recall everything.

Stage III. Complete: Events occurring during hypnosis are forgotten entirely, even if again hypnotised.

There is no danger in hypnotism. Its induction by the experienced and educated operator has never and could never have any harmful effect on the mental state of the patient. It may be as well to note that no suggestion made by the operator which would arouse the moral antipathy of the patient would be effectual. A person cannot be hypnotised at a distance nor against his will. Contrary to the usual idea entertained by most people, strong minded persons are more susceptible and are better subjects than the hysterical or weak-minded. Dr. Wingfield, of Cambridge, found his best subjects among the athletic students of his College. It is not always necessary nor desirable for the subject to be in the deep hypnotic state for curative suggestions to be made although quicker results would probably be obtained in that condition.

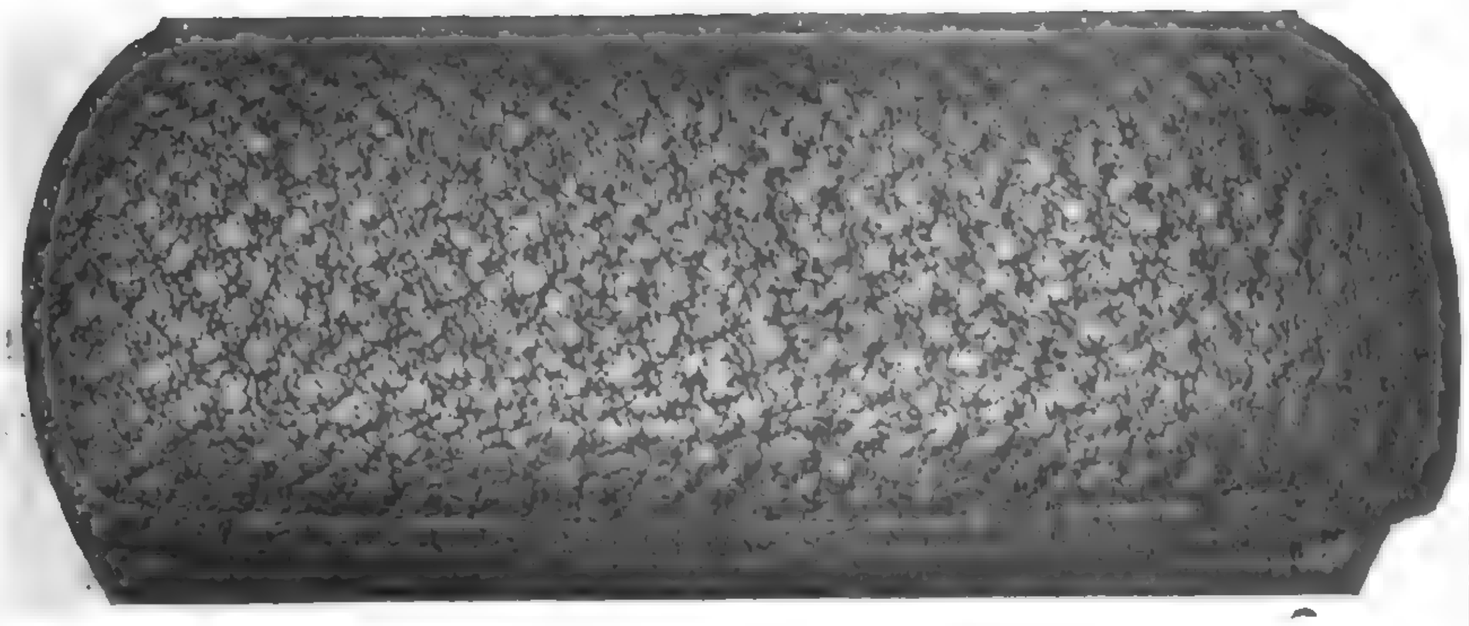
Many medical men who have employed hypnotic suggestion as a cure for nervous conditions have found it a wonderful factor. Dr. Liebault, of Nancy, and the Parisian Clinique for nervous maladies have records of wonderful cures wrought through its agency. Dr. Brown, of London, has achieved remarkable success with this treatment in cases of war-neuroses and "shell-shock." However, hypnotism is not suitable in *every* case.

Failures and disappointments must be met. There is much to be yet learned, and it seems that Mesmer's original theory was not without foundation. A secret invention by Dr. Russ, was shown at the last Ophthmological Congress, this electric intsrument being set in motion by a glance from the human eye. An American scientist also recently proved that a weak electro-magnetic current was sent out from the human eye. Be this as it may, we are living in an age of discovery, and in a few years we may have to unlearn many of our present day physical laws.

As I consider the treatment of patients by suggestion is essentially proper for medical men only, I shall not here deal with the various methods of induction or hypnoses.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

"WERTEX"
WILLMOTTS'
LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.



12E 12E

Let the Cases you handle be more than mere containers, let them reflect the quality of their contents and be a lasting reminder of the services you render.

Use "WERTEX" Cases.

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

ENGLAND.

C2

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

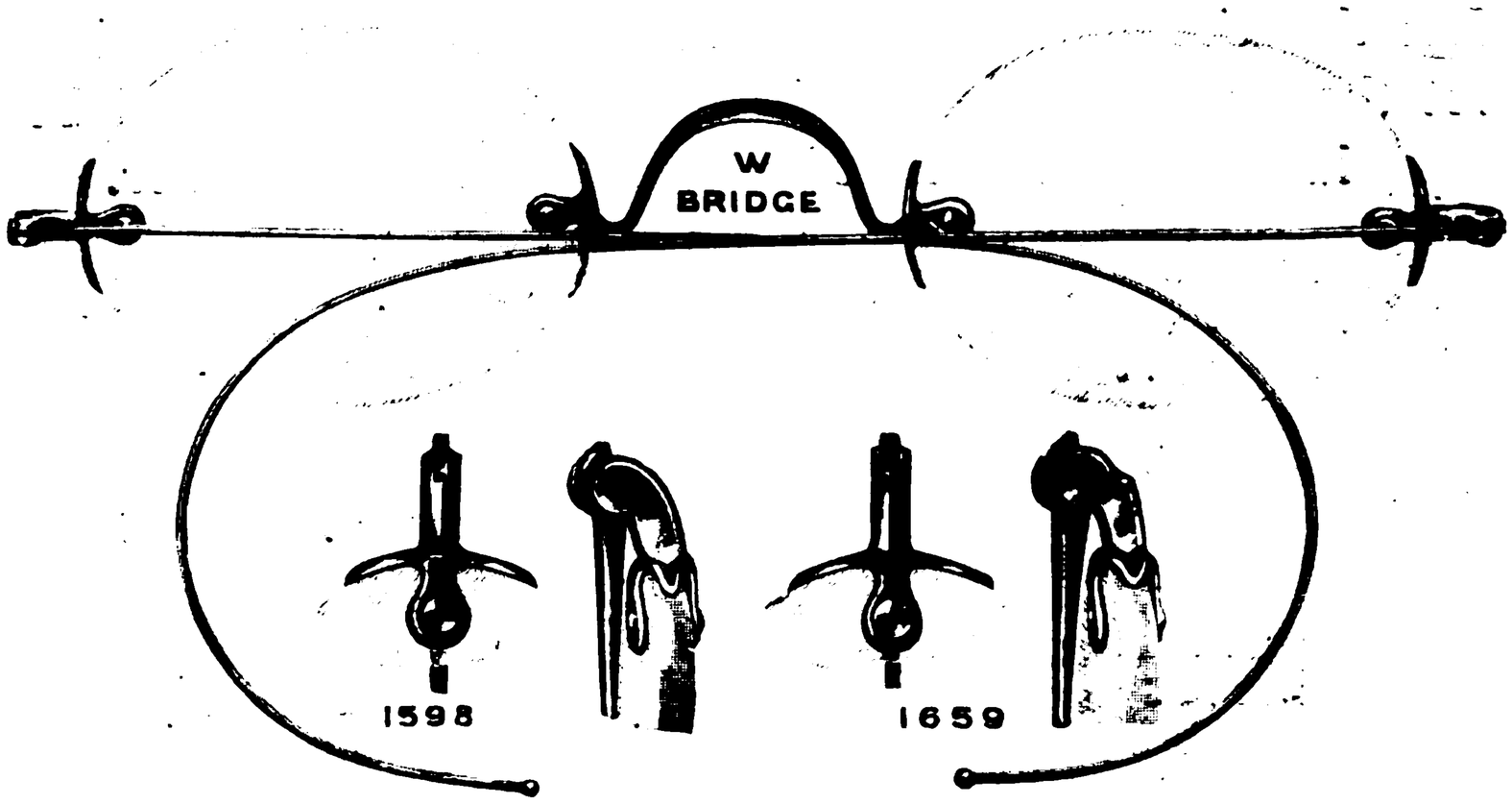
QUALITY FIRST

DUPAUL, YOUNG OPTICAL CO.,

ESTABLISHED 1888.

SOUTHBRIDGE, MASS., U.S.A.

Manufacture only Guaranteed Quality and Best Finish Gold-Filled and White Metal Spectacles, Eyeglass Frames, Astigs, Mountings and Materials.



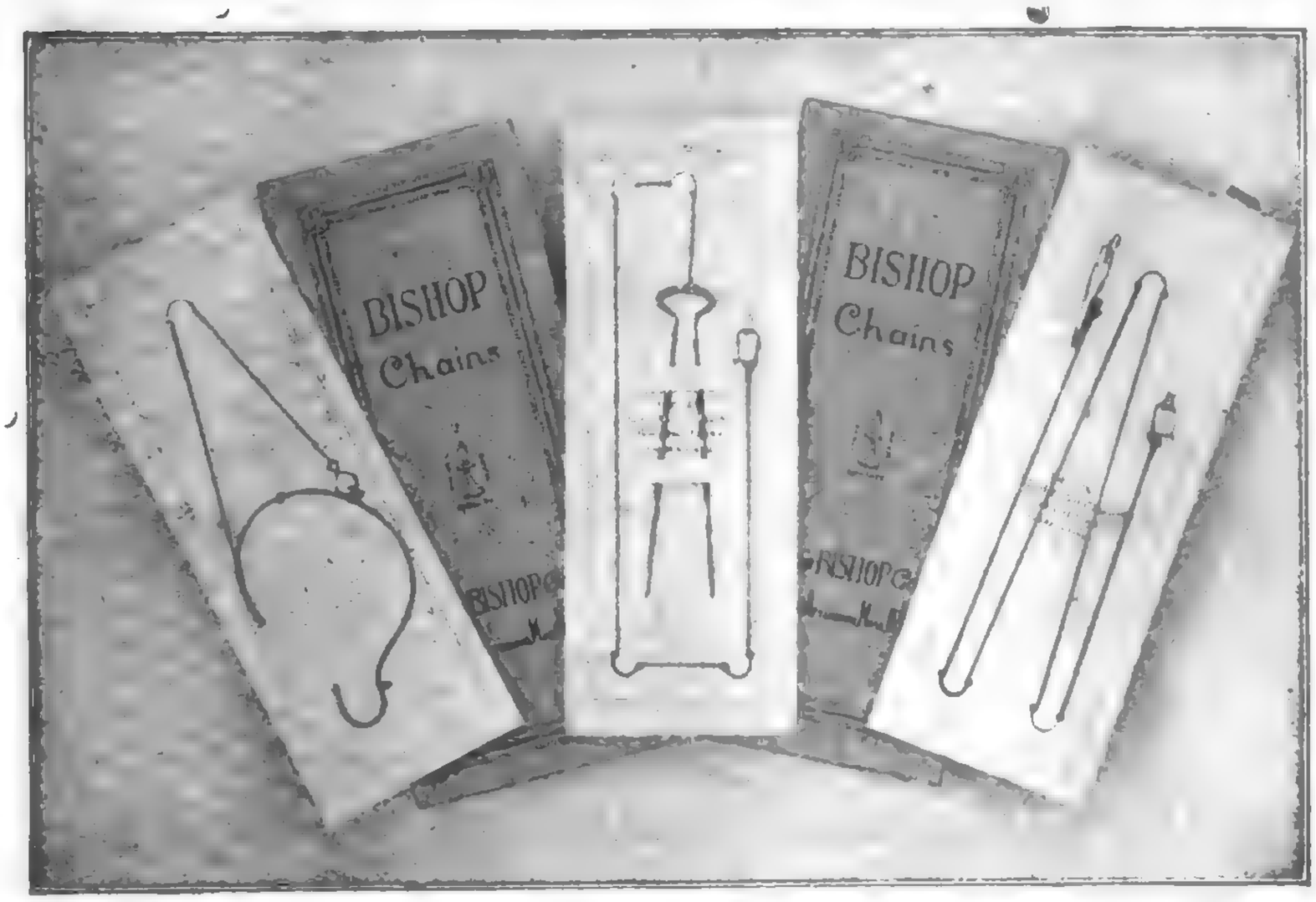
To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY





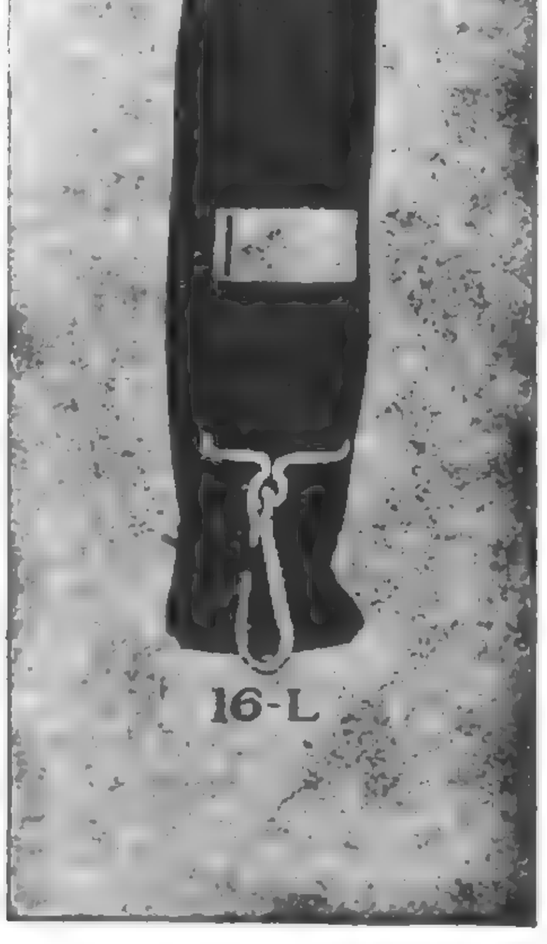
BISHOP CHAINS

should be your standard of Quality,
in solid Gold and Gold Filled,

BISHOP SILK EYEGLASS CORDS AND MONOCLE RIBBONS.

With Gold Filled, Silver or Gun Metal snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.



To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Consider Everything and Judge.

AN opinion based on insufficient data is valueless. Consider the L.O.C. Rx Service offered to Sight-Testing Opticians in this country. The facts are :—

(*a*) Our equipment is the latest of its kind. Appliances are often scrapped for those of newer pattern.

(*b*) Our staff is highly skilled; at one with us in rendering efficient service, and absolutely trustworthy.

(*c*) Our organisation is so arranged as to facilitate work at high speed.

Special rush jobs are in hand five minutes after receipt and, provided the work involved is reasonable, sent back by return of post.

(*d*) Our prices are the lowest consistent with sound workmanship.

These are the facts on which we solicit your patronage. Examine them and decide as to the destination of your next Rx order.

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C.1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris, France.

Also at—2, Str. Barsei, Bucharest, Roumania.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Radiations, Illumination and Colours.

By Dr. MAX COQUE, B.Sc.

1—RADIATIONS.

In normal conditions, the stimulation of the optic nerve which gives rise to a luminous sensation is initiated by the impact on the retina of certain radiations.

It is a well-known fact that if we receive on a prism a luminous beam proceeding from the sun or from an electric arc lamp we obtain an image made of a continuous and variously coloured band termed a spectrum. To be more precise, we might observe that if the source of light is the sun, the spectrum is not absolutely continuous and presents a number of dark lines termed Fraunhofer's lines from the name of the scientist who ascertained their existence and explained how they are produced. This fact, upon which we shall come again later on, is of no importance from our immediate point of view.

In the infinite variety of colours which compose the spectrum, it has become the custom to distinguish arbitrarily seven main hues which occur in the following order, violet, indigo, blue, green, yellow, orange, red, the violet corresponding to the most deviated, the red to the least deviated portion of the spectrum.

The two ends of the spectrum gradually fade away into darkness but as we shall explain more fully presently, the position of the boundaries terminating the visible spectrum does not depend upon anything whatever in the nature of light regarded as a physical phenomenon. The visible spectrum is limited solely by the physiological constitution of our visual organs and the fact that it begins and ends where it does is, from a physical point of view, a mere accident.

The spectrum actually projected upon a screen is in truth much longer than the portion of it which anyone can see, as it extends for a distance at least equal to the length of the visible spectrum beyond the violet at one end, and beyond the red at the other end, these invisible portions being known as the ultra-violet and the infra red regions respectively.

If we displace a highly sensitive thermometer, as an electric thermometer or a bolometer, in the visible spectrum, we find that it is hardly affected in the violet portion, but that it shows an increase of temperature as we move towards the red end; besides the same effect occurs outside the red up to a distance about equal to that separating red from violet. If, on the other hand, our spectrum is projected on a sheet of photographic paper, it can be easily ascertained that though this paper is more or less acted upon in the whole of the visible spectrum, this effect is variable, being hardly sensible in the red and increasing towards the violet. Moreover, the photographic paper is affected beyond the violet, for a distance about equal to two or three times that separating the extreme limits of the visible spectrum. Thus, the solar spectrum really consists of three parts, namely, a visible part, extending from the extreme red to the extreme violet, and two invisible parts termed respectively the infra red and the ultra violet.

For reasons we cannot enter into within the limits of this article, scientists have been led to admit that the above phenomena depend on a same cause, namely, the energy communicated to the eye, or to the thermometer, or the photographic paper by radiations emitted by the sun or by the source of light which has served to produce the spectrum.

What is the exact meaning of the term radiation?

The universe does not merely consist of the solid, liquid or gaseous bodies we know through our sense organs. According to a hypothesis generally adopted there is a very subtle, imponderable medium termed ether which escapes our most accurate means of observation and which pervades all space, at least up to the most distant stars. Not only does this medium fill what we term vacuum, the vacuum of interstellar spaces as well as that we can produce with our best pneumatic machines, but it also penetrates, without any difficulty, all material bodies, even the most compact; to use a somewhat rough comparison, ether flows through material bodies, as water passes through a net or air through a fine gauze.

This medium ether, which must have a considerable elasticity, is able to vibrate, and the vibrations produced at any point are transmitted in all directions in vacuum as well as in material bodies as ripples or waves are produced and propagated when a stone is dropped into a pond of water; these ethereal vibrations constitute what is termed radiations.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

This propagation of vibratory movement corresponds to the transfer of a certain amount of energy which, in certain conditions, may be transmitted wholly or partly to material bodies, and these bodies undergo modifications which differ from one another, not by their cause which is the same, namely, energy, but by the nature of the reactions these bodies are capable of exhibiting, according to their constitution or to the conditions in which they are placed.

Constitution of Matter.

Without entering into details which are beyond the scope of this paper, we will state that all material bodies are made of molecules which are not in contact with one another but which oscillate round each other with an enormous velocity that depends on the temperature of the body. It is this vibratory movement which is the source of molecular kinetic energy and it is only at the temperature physicists call the absolute zero that the molecular movement is stopped. The absolute zero corresponds, to −273° C. If a body, for instance, a gas, could be cooled to that temperature, it would have no pressure since it would have no kinetic energy, no heat.

The vibratory molecular movement we have just mentioned, taking place in the medium ether, causes in it a wave motion which carries the energy in all directions away from the body itself.

When these ethereal waves strike the retina of an eye, or a photographic plate, or a highly sensitive thermometer, they produce, according to their wave-length, a sensation of light, or they act on the photographic plate, or they produce an increase in temperature shown by the thermometer. Thus, sensations of light result from the actions of ether waves of a proper wave length upon the sensitive elements of the retina, but the old belief that the sensation was primarily due to a series of mere mechanical impulses or beats, just as a sound results from the mechanical impact of air waves upon the sensitive organs of the internal ear, cannot any longer be upheld.

The famous researches of Hertz have established upon a secure experimental basis the hypothesis of Maxwell that light is an electromagnetic phenomenon. Such electric radiations as can be produced by special instruments and which are used in wireless telegraphy are found to behave in exactly the same way as those to which light is due. They travel through space with the same velocity, they can be reflected, refracted, polarised, and made to exhibit interference effects. No fact in physics is much more firmly established than that of the essential identity of light and electricity. It follows that the displacements of ether which constitute light-waves are not necessarily of a gross nature as those which we see on the surface of water, or which occur in the air when a sound is transmitted through it. The displacements which the ether undergoes are not mechanical, primarily at all events, but electrical.

Everyone knows what a simple mechanical displacement is; the vibration of a pendulum gives a good example of such a displacement. But if we electrify a stick of sealing wax by rubbing it with flannel, the surrounding ether undergoes electric displacement; the exact nature of this phenomenon is not known but ultimately no doubt, it will be found to be of a mechanical nature, though it is almost certainly not a simple bodily distortion such as is caused for instance when one presses a jelly with the finger.

It is recognised by all scientists that there must be a universal medium, an ether, capable of transmitting at the sped of 186,000 miles or 300,000 kilometers per second, disturbances which, whatever their real nature, are of the kind mathematicians call waves. The essential nature of the action produced by ether waves on the eye is not determined yet, though many guesses at the truth have been hazarded. It may be electrical or chemical or both. Ether waves, we know, are competent to bring about chemical changes as in the familiar example of the photographic plate. They can also produce electrical phenomena as, for instance, when they fall upon a suitably prepared piece of selenium, but there is no evidence that they can exert any direct mechanical action of a vibratory character, and, indeed, it is barely conceivable that any portion of our organism should be adapted to take up vibrations of such an enormous velocity as those which characterise light-waves.

The Visible Spectrum.

Of the multitude of ether waves which traverse space it is only comparatively few that have the power of exciting a sensation of light. As regards this limited range of sensibility, there is a close analogy between hearing and seeing. No sensation of sound is produced when air-waves beat upon our ear unless the rate of the successive impulses lies within certain definite limits. It is just so with vision. If ether waves fall upon our eyes at a less rate than about 420 billions per second

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

INVISIBLE FRIENDS :

Since the inception of the W.O.W. Rx Service two years ago, we have made numerous firm friends. They have never seen us. We have never seen them. Yet we know and understand each other.

. . . .

We do our best for them (the W.O.W. best is a really good best) and they in return help us by their continued orders, and often by recommencing our service to fellow Opticians.

. . . .

Many of the W.O.W. supporters have come to us by sheer recommendation, and we are justly proud of it. Experience the Willesden Way yourself. We are keen, young and eager to satisfy.

. . . .

The W.O.W. service is *the* service for satisfaction. Incidentally it saves you money, but we will not press the money gain here, lest you should (as many do) find it difficult to believe that it is possible to pay less and yet obtain the very best of quality and service.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY:
DUDDEN HILL LANE,
WILLESDEN, N.W. 10

F. PARKER WOOD,

Wholesale Manufacturing Optician,
47, MARK LANE, E.C.3

Immediate delivery from stock:

TELESCOPES
FIELD GLASSES
PRISM GLASSES
MICROSCOPES
ANEROIDS & CLOCKS
BAROGRAPHS
SEXTANTS
BINNACLES
COMPASSES
CHRONOMETERS, New & Second-hand

Repairs a Speciality.
Clinicals and all other Thermometers.

PARALLEL GLASSES of every description.

Scientific Instrument Makers.

MICROSCOPES of all kinds manufactured at our own works.
REPAIRS to Prismatic and other Binoculars etc., promptly executed.

H. H. SHARLAND (H. KEMP),
9 & 10, THAVIES' INN, HOLBORN CIRCUS, LONDON, E.C.
Tel.: Holborn 4246. Established 1864.

Every Description of Ophthalmic Supplies.
All Requirements of the up-to-date Sight Testing Optician.
Good Special Lines at keenly Competitive Prices.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Prefix is alright but what really counts is

THE SUFFIX

Crookes glass dates back to say 1913, and made by anyone is original and genuine, but it is important to remember that applies only to Sir Wm. Crookes A and B Glass. Since that date much water has flowed under London Bridge and Sir William only ceased his labours when he brought out his *Ultimate* Glass—the result of his long years of research. The only genuine Crookes Ultimate is made by—

SIR WILLIAM CROOKES ULTIMATE ANTI-GLARE GLASS CO., LTD.,

30, WIGMORE STREET, LONDON, W.

REMEMBER THE SUFFIX—ULTIMATE.

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,
DANDURAND BLDG., MONTREAL.
Cable "Optical" A.B.C. Code 5th. Edition.

Worshipful Company of Spectaclemakers.

Tuition for the Company's Examinations in Optics and Sight Testing at
THE SCHOOL OF OPTICS Ltd.

2, GUILFORD PLACE, LONDON, W.C. 1
Particulars on application.

Hospital Rx Work

A REVOLUTION IN PRESCRIPTION PRICES

We have just Organised a New Department to cope with Large Quantities of

HOSPITAL AND EDUCATIONAL CONTRACT WORK

PROMPTLY AND ACCURATELY

AT EXCEPTIONALLY LOW PRICES

SEND FOR PRICE LIST.

Telephone: HOLBORN 1620 (Private Exchange).

KIRK BROTHERS
WHOLESALE & MANUFACTURING OPTICIANS

Telegrams: KIRBROREX, HOLB. LONDON.

36, GRAY'S INN ROAD, LONDON, W.C. 1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

or at a greater rate than 750 billions per second, no sensation of light is perceived. The same fact may be stated in another and more convenient way. Since all waves that are propagated in ether travel through space at exactly the same speed namely, 300,000 kms. or 30,000,000,000 cms or 3×10^{10} cms. per second it follows that the length of each of a series of homogeneous waves must be inversely proportional to their frequency, *i.e.*, to the rate at which they strike a fixed object such as the eye.

Wave-lengths.

Instead, therefore, of specifying waves by their frequency we may more conveniently specify them by their length. Waves whose frequency is 420 billions per second have a length which is the four-hundred twenty billionth part of 300,000 kms., *i.e.* (if expressed in mms.) of 0.000712 mms. To express such small lengths, the millimeter is too large a unit; even the microm, *i.e.*, the thousandth of a millimeter, denoted by the Greek letter μ, and used as unit of length for microscopic objects, is still too large. It is the custom to express wave-length in milli-microms, denoted by $\mu\mu$; a milli-microm is one-thousandth of a microm or a millionth of a millimeter. Hence the wave-length of those waves whose frequency is 420 billions per second is 712 $\mu\mu$. Some authorities take as unit the tenth of a milli-microm which is called the tenth-meter or Angstrom unit. A wave-length of 712 $\mu\mu$ is 7120 tenth-meters or 7120 Angstrom units, generally written 7120 A.U.

In the same way ether waves frequency is 750 billions, have a wave-length of 390 $\mu\mu$ or 3900 Angstrom units. Waves of a length greater than about 7120 Angstrom units or less than 3900 units have no effect upon our organ of vision. Wave-lengths of about 712 $\mu\mu$ gives rise to the sensation of red, of about 390 $\mu\mu$ to the sensation of violet. Intermediate wave-lengths give rise to the coloured sensation between red and violet.

As we have already pointed out the position of the boundaries terminating the visible spectrum does not depend upon anything whatever in the nature of light regarded as a physical phenomenon. Ether waves which are much longer and much shorter than those which illuminate the spectrum certainly exist and evidence of their existence is supplied by their effect on a sensitive thermometer in the case of the former and by their effect on a photographic plate or on photographic paper in the case of the latter. Such waves, however, fall upon our eye without exciting the faintest sensation of light.

The visible spectrum is limited solely by the physiological constitution of our organs of vision and the fact that it begins and ends where it does is, from the physical standpoint, a mere accident.

As the late Lord Salisbury said at the meeting of the British Association at Oxford, the function of the ether is to undulate, and in fact, it transports energy from one place to another by wave motion. Some of its waves, such as those which are initiated by a dynamo, and are made use of in wireless telegraphy, may be hundreds of meters in length, others may be shorter than 100 $\mu\mu$ or 1,000 A.U. as is probably the case with those associated with *x*-rays, but all, so far as is known, are of essentially the same character, differing from one another only as the billows of the Atlantic Ocean differ from the ripples created on the surface of a pond when a stone is dropped into it. No matter how the disturbance in the ether is set up, whether by the sun, or by a dynamo, or by a hot flat iron, in every case the ether conveys nothing at all but the energy of a wave motion and when the waves, encountering some material obstacle which does not reflect them, becomes quenched, their energy takes another form and some kind of work is done, or heat is generated in the obstacle. The whole or at least the greater part of the energy given up by the waves is, in most cases, transformed into heat, but under special circumstances, as for instance when the waves fall upon a green leaf, or a living eye, or a selenium cell, a few of them may perform work and give rise to chemical changes in the leaf or to a sensation of light in the eye, or to electric phenomena in the selenium cell.

Transmission of Energy.

The process of the transmission of energy from a body to another by propagation of a wave motion, through an intervening medium has long been spoken of as radiation, and in recent years the same term has been largely employed to denote the energy itself while in the stage of transmission. "Radiation" in this sense, meaning ether wave energy, includes what is often called light. One often reads that light travels from the sun to the earth in 8 minutes, but while on its journey it is not light in the true sense of the word; neither does anything in the nature of light start from the sun. As Prof. Bidwell puts it "Light has no more existence in nature out-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

side a living body than the flavour of onions has; both are merely sensations."

If a boy throws a stone which hits you in the face, you feel a pain, but you do not say that it was a pain which left the boy's hand and travelled through space to you. The stone instead of causing pain in a sentient individual might have broken a window or brought down an apple, in which case the muscular energy spent by the boy in throwing the stone would be transformed in mechanical work or again, if the stone strikes an obstacle which it can neither break nor penetrate, the energy carried by it is transformed into heat as shown by an increase in the temperature of the stone. The amount of heat thus produced by a stone striking an obstacle is small and difficult to appreciate, but everybody knows that if a bullet is fired from a gun and is received on a plate of hard steel, the bullet, suddenly arrested in its journey through space may become red hot; the energy stored in the explosive used to propel the projectile is transformed into heat. Had the steel plate been less hard a portion of the energy carried by the bullet would have been spent in penetrating more or less deeply into the plate, *i.e.*, would have been partly transformed in mechanical work. Just so, the same radiation which when it chances to encounter an eye, produces a certain sensation which will produce a chemical effect if it falls on photographic plates, an electrical effect if it falls on a selenium cell or a heating effect in almost anything. Why then should it be specially identified with the sensation?

Infra-red Rays.

Radiation also includes, and is nearly synonymous with, what is often miscalled radiant heat. After what has been said just now, it is clear that there is no such thing as radiant heat. The sun or any other hot body generates wave energy in the ether at the expense of some of its own heat and any distant substance which absorbs a portion of this energy generally, though not necessarily, acquires an equivalent amount of heat. The result may be the same as if heat had left the hot body and travelled through space, but the process is different. It is like sending half-a-crown to a friend by postal order. You part with a half-crown and your friend receives a half-crown, but the piece of paper which goes through the post is not a half-crown. It is strictly correct to say that the sun loses heat by radiation just as you lose a half-crown by investing it in the purchase of postal order. But that is not the same thing as saying that the sun radiates heat.

The term radiation has the advantage of avoiding any suggestion of the fallacy that there is some essential difference in the nature of the ether waves which may happen to terminate their respective careers in the production of light or heat or chemical actions or anything else, but it is unfortunately impossible in the present condition of things to use it as freely as one could wish without pedantry, and we must still often speak of light or heat when the term radiation would express our meaning with greater accuracy.

All observations and known facts tend to prove that there is no essential difference between the causes which produce luminous sensations of various colours, those which act on photographic paper, *i.e.*, which give rise to chemical or actinic phenomena.

Differences of Wave-length.

All those phenomena are due to radiations and the only difference consists in the various values of the duration of the vibration or, which comes to the same, in wave-length of these vibrations. We can go further. Apart from the ether waves set up by the molecular vibratory movement of material bodies and which give rise to the infra red, the visible and the ultra violet radiations, it has been found that when an electric spark passes between two metal balls, ether waves of relatively considerable wave-lengths are set up and transmitted through space; it is this kind of waves which is utilised in wireless telegraphy. The shortest wave of this kind which has been obtained has a wave-length of about 3 mms. but powerful sources of electricity may give rise to radiations, the wave-lengths of which, may reach 300 meters or more.

These electric or Hertzian waves (from the name of their discoverer) appear in all respects to be similar to those which give rise to the visible and non-visible spectra, the only difference being in the wave-length or the frequency. They travel through space at the same rate, they can be reflected, refracted, polarised and made to exhibit phenomena of interference.

It follows that the four great groups of ether waves or radiation, namely, the actinic or ultra-violet waves, the visible radiation, the infra red or calorific waves and the electric or Hertzian waves are really and essentially the same in nature and consists in periodic disturbances or waves, propagated through the ether in every case with a speed of 300,000 kms. per second.

[To be continued.]

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Has Mr. M. B. Bloom Revolutionised the Optical Trade in Great Britain?

Fifteen years ago the nation's eyesight was in danger. The ever increasing stress and strain of modern life was beginning to tell its tale. Scientific eye-testing was little understood, only the wealthy could afford that expert attention which is vital to eye-health. Hide-bound by tradition, and a false professional conservatism, the opticians of Great Britain utterly failed to appreciate their duty to Humanity and also to recognise the vast commercial field that lay open before them.

The less wealthy classes who were not educated to appreciate the importance of scientific eye-testing thought any glasses that magnified were good enough. People picked up their eyeglasses on street barrows, and at 6½d. bazaars, and cases of defective vision instead of yielding to expert treatment were aggravated, and in many cases the sight was hopelessly ruined.

Such was the condition of affairs when Mr. M. B. Bloom came on the scene and started the great optical concern that bears his name. He realised that the whole system of sight-testing was out of date and inadequate. With characteristic energy he set himself to relegate these methods to the scrap heap, and substitute an organisation that should educate the millions of people who were ignorant on the subject to take care of their sight—and take care of it in time.

He invented the phrase, "To Help a Nation's Vision," and thousands of people to-day have to thank him for his pioneer work in the cause of the national eyesight. From the first he realised that the public could only be educated by a bold advertising campaign. By this means he was able to point out to millions of eye-sufferers the importance of seeking the advice and services of a skilled optician at once.

Bloom publicity was something new; vivid, forcible, original. The innovation fell like a bombshell in the old-fashioned optical camp.

Like all men who have made history he was bitterly attacked. Opposition of the most determined character, met with on every side; but this only served to stimulate his efforts. The optical industry did not realise that he was advancing their interests as well as his own.

At the same time a complete organisation to cope with the demands of the public was being built up—an organisation that, starting with one small shop in Bedford Street, Strand, now has fifty perfectly equipped optical retail sight-testing establishments throughout the country.

In his campaign of education, Mr. Bloom was out to practise what he preached. It was no good advocating efficient sight-service at a cost within the reach of everybody, if such a service did not exist. In these branches he aimed to give it. Sight-testing was undertaken free. Advice was freely given without any obligation on the part of the enquirer. Eye-glasses of the finest quality were supplied at prices that brought them within the range of all classes.

Glasses for all classes was the motto of the concern. The servant received as much attention as the duchess. This policy resulted in an educative and commercial triumph, and it remains the policy of Bloom's, Ltd., to-day. Everything possible is done to ensure the public a generous and efficient eyesight service, and it is doubtful if in completeness of scientific equipment there is any other retail business to equal it in the world.

Every man and woman employed by Blooms, Ltd., is chosen for his or her technical knowledge, and at every one of their branches a qualified and practical optician is in attendance. By the term "qualified" we do not mean to imply the mere holding of a diploma—experience is just as essential as theory in optical work. At only eight of their branches are managers employed who do not hold a certificate of examination granted by one or other of the two bodies which are issuing such, and in each of these cases they have had at least fifteen years' practical experience in the testing and fitting of glasses.

As the success of the organisation became apparent this human dynamo decided to start his own prescription factory for dealing with the multitudinous requirements of his numerous branches. To think with him is to act. In a very short time the prescription branch in Ridgemount Street—probably the finest factory of its kind in the world—was in operation. It is the proud boast of the management that an order received from any branch can be executed and dispatched on its return journey within forty-eight hours. The workpeople employed here are the most skilled workers in the optical trade.

It was well for the business that this factory was established, since hospitals, schools, Health Societies and leading commercial houses throughout the country are availing themselves of its up-to-date organisation.

This Napoleon of the optical industry is not only content to have a great public well and honestly served. "I want my people happy and contented," he says. "There's no good

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

work where worry reigns. I have 600 happy, contented, competent craftsmen in my businesses, all working and working enthusiastically, saturated with the Bloom atmosphere—the Bloom point of view—the Bloom ideals of efficiency. Working for the public they serve, the firm, and themselves. No wonder the name of the firm stands for super-efficiency. They have their social and athletic clubs; all the human amenities that make industrial work a joy instead of a labour; and they know that the presiding genius is a human being to whom they can come with their joys and woes. Mr. Bloom does not claim to be a philanthropist, but he does claim to set the happiness of his fellow human beings before dividends.

No wonder there has never been a strike or any sort of labour trouble at Blooms.

No wonder that Blooms can laugh at opposition.

No wonder there is a note of justifiable pride in Mr. Bloom's voice when he tells of the silver loving cup presented by the staff, and points to the illuminated address on the wall dedicated to "The Ideal Employer."

One would have thought that the successful establishment of this great organisation would have satisfied this energetic young man of 39, but no! there was still a big job in front of him to make Great Britain independent of foreign made spectacle frames and mounts.

Ninety-five per cent. of spectacle frames and mounts were being imported from abroad; and he realised that many British craftsmen could be employed in the production of the essential parts of a spectacle, thereby opening a new field of occupation for British workers. He proceeded to equip a factory, and after two years' work and an expenditure of over a hundred thousand pounds, he has succeeded in completing the organisation and equipment of Tennyson Works, Willesden Lane, N.W.

The intention of this important undertaking, known as Optics, Limited, is to strictly adhere to the business etiquette by supplying their goods solely to the recognised wholesale houses, and that no account shall be opened by them with any retail firm, large or small, including Blooms, Ltd., themselves. Letters from Optics, Ltd., are being sent to every recognised wholesale house bearing out the arrangements indicated above. Optics, Ltd., must be recognised as an entirely separate unit from Mr. Bloom's other interests.

Some idea of the extent of this venture may be gathered from the fact that the works contain one of the finest optical machinery halls in the country devoted entirely to the manufacture of machine tools for use in other departments of the factory. So accurate is the work that the machines used are gauged to operate to within one half a hundredth of a millimenter—a degree of precision that is not approached by any other ophthalmic factory in the world. All this great organisation is now in operation and working automatically.

This Wizard of the optical industry is free to conquer new worlds. What will he do next? He certainly cannot stand still. From what one gathers in conversation he has had another brainwave that will revolutionise the world's optical trade. Well, we hope so.

LIVING PICTURES.

A COMPLETE ILLUSTRATED HISTORY OF LIVING PICTURES and the KINEMATOGRAPH.

Detailing every invention from the year 65 B.C. to date.

Price 6s. Post Free.

This Book is a revised edition of the work "Living Pictures," by H. V. Hopwood, brought thoroughly up-to-date, and will be the standard work on the subject, written in a popular and very interesting style.

Must be in the hands of Every Kinematograph Operator.

It will also be invaluable to everyone interested in the kinematograph and living pictures industry, as well as the workers themselves.

THE HATTON PRESS, Ltd., 125, Fleet Street, London, E.C. 4

A New Optical Publication.

"PRESCRIPTION PITFALLS and How to Avoid Them,"

By HENRY C. RAXWORTHY ("Obfuscando")

ONE SHILLING AND SIXPENCE.

No Retailer or Wholesaler should be without a copy. An entirely original work.

Published by The HATTON PRESS, Ltd., and obtainable of all wholesalers.

VISUAL OPTICS & SIGHT-TESTING

By LIONEL LAURANCE.

A New Edition, just out. Price 21s. 21s. 9d. post free.

GENERAL AND PRACTICAL OPTICS

By LIONEL LAURANCE.

A New Edition. Price 21s. 21s. 9d. post free.

The two ideal books for the acquirement of a knowledge of the subjects indicated by their titles.

THE HATTON PRESS, Ltd., 125, Fleet Street, London, E.C.4

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

Case for Diagnosis.

Sir,—With reference to the "Case for Diagnosis" described by a Birmingham correspondent in *The Optician* of September 23rd.

I should be inclined to think that weakness of the internal recti is the cause of the symptoms described, and would suggest a careful examination of the muscle balance, followed by usual treatment laid down for such a condition.

T. S. Edwards.

Llandrindod Wells.

Sir,—Referring to "A Case for Diagnosis" in your last issue, the writer only gives the Rx previously worn (R. & L. +1.0 sph.) and the present one R. +1.50 sph. ⊂ +.25 cyl. ax. 120°. L. +1.50 sph. +.25 cyl. ax. 85°, with prism 1 △ base in each eye. The outstanding feature of the complaint being diplopia, might I suggest that he tests the case out himself and gives the result of his findings, which might further help to elucidate matters. With all due respect to the medical man who gave the above prescription, does the optician find the refractive error as above duly verified, particularly in regard to astigmatism, and the axes of the cylindricals.

Then I should suggest that he carefully tries out the following. The condition of the pupils and their re-actions. The muscle test at distance. Whether exophoria or esophoria (the physician's precription indicates relief for exophoria). The muscle test for vertical imbalance (Maddox Rod horizontal, and see that subject's head is quite level). This I need hardly remind him as being important, and if any imbalance is found it should be corrected with prism base up or down as required. The amount being equally divided between the two eyes. If orthophoria is proved at the distance tests, try the same at near, and I would particularly advise him to test the strength of convergence. If that is below what it should be, then muscle exercises—being a young subject—are appropriate, and the convergence should be brought up to a high degree of efficiency. This should then enable him to concentrate on close work without fatigue.

I am inclined to think that it is in either of these directions that the trouble lies. I should have thought from the history of the case that it would be more suitable in medical hands for nerve treatment, etc. Perhaps the subject is having that. However, if the optician is asked to do his best, I trust above hints may be of use.

Harrovian.

Dioptric Powers.

Sir,—Your September 16th issue gives notice that Mill Hill are to produce improved lenses —a subject in which I am deeply interested. I hope their efforts will assist in placing ophthalmic optics a shade nearer perfection.

May I point out an apparent error in the paragraph:—"They are made with a power to produce at the cornea the same wavefront as standard trial-case lenses if considered as worn 15 millimeters from the eye."

A vertex corrected lens has the same equivalent power as a flat trial lens whether it is placed 15 millimeters from the cornea or *anywhere else*, on an optical bench for instance.

No two equivalent lenses correct the same amount of refractive error unless they are placed in the same plane.

G. J. Hunt.

Hackney.

[While our correspondent has taken a fair debating point, the implication which he reads into the quoted paragraph, in order to correct it, seems a little strained. The wording had not conveyed to us at any rate, anything other than a statement of exact equivalence, conforming to a rule that is approved in practice and conditions the effective dioptric power.—Ed.]

The Tariff Question.

Sir,—I was interested to see a remark in your issue of September 16th, that this country might with advantage copy the wisdom of some other people who found themselves in difficulties nearly three years ago. The trouble here is what was inevitable however, as the accident of fortune; since here as elsewhere, democracy defeats itself. Our democratic Government is least concerned with pursuit of the ideal "greatest good for the greatest number," and most occupied with pretending to pursue it, while sacrificing the end in itself to the political means of mutual

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

accommodation by rival party faddists, doctrinaires and demagogues.

Since comparatively few people "think for themselves," on politics, the popular Press must be one of the main instruments of Government "by the people for the people"; but a fatuous instrument that is, because even when quite honest in the political sense, it affords a mere window-display of opinions, freshly collected perhaps each day from experts free to voice the wishes of their own clients or of themselves, without any regard for the general interests of the reading public, to whom, indeed, they have no sort of responsibility.

Opticians know that the sage advice given by the daily Press sometimes on the subject of treatment of defects of sight, is in nearly every case inspired by medical practitioners. So with, for instance, all questions of international finance, the newspaper is a mere exponent of some banker's opinion; and it follows that the public at large has banking interests recommended to it, as distinct from and opposed to the interests of industrial concerns. For these and many other like reasons connected with the prevalent ignorance and thoughtlessness, it follows that the long-suffering public is fooled and fleeced.

In the ordinary course of things there must come some limit to an exploitation of our manufacturing and mercantile industry which ignores plain facts and defies economic law. People are beginning to wake up to the prospect that by following the banker's creed of conservatism to its logical end, they will be left with nothing but mortgages of one kind and another to bank; while the bankers themselves, ready enough to reap the profits of negotiating such paper, will draw their purse strings ever more tightly around our limited supply of currency. It is an old grievance that financial assistance from the banks, for extending a sound mercantile or manufacturing undertaking, is much harder to obtain in this country than in the other great industrial communities; and a sign of the times is that, from what I am told, bankers' terms are becoming even more stringent.

Worse than any other evil felt in our industrial sphere is the scandal of the unrestricted import of goods without compensatory levy against an adverse exchange. This miserable one-third provided for in the Safeguarding of Industries Bill is an insult to common-sense. It is so obviously either too little, or else altogether superfluous and improper. It stands for nothing but a banal compromise in party politics. The reasonable measure would have been a countervailing duty, as suggested in *The Optician* of June 13th, 1919, to be levied on goods which compete with British manufactures and not levied on other goods which do not so compete. The greed of the Free Trade interests resists this obvious expedient, because it would protect prices in the home market.

We need such a level of prices in our home market as will afford employment for British capital and labour in home industries, and thus, by prospering our factories, enable us to do some "dumping" on our own account (at lower prices) through the waiting channels of export trade.

Luckily, the key industries have received a kind of solatium on account. It will have to be increased in the direction of dealing with the exchange *impasse*; and British Capital and Labour should unite in demanding measures to check the emigration of other industries to the Continent.

SIGMA.

Window Attractions.

Messrs. J. & R. Fleming have introduced several seasonable window attractions, which may be seen at their showrooms at 146, Clerkenwell Road, E.C.1., among the latest being a set of five metal signs, copper finished, with black wordings each of which fit into a mahogany finished stand. Particulars may be had on application.

The Secretary of Hamblin's Football Club would be pleased to hear from any optical firm having a football team. Please address Mr. H. Whitmarsh, 13, Hartingdon Road, Walthamstow, E.17.

Chevallereau states with reference to causes of myopia, that no one is ever born myopic and that the affection comes from working with too close a focus, with resulting compression of the media and lengthening of the eyeball. Cantonnet states, of strabismus, that nearly all sufferers from these deviations can be cured by re-education, provided the affliction is of recent date and slight degree and the vision has equality of vision and refraction in both eyes. Referring to ocular headaches, he lays special emphasis on the type due to strabismus.

Matter intended for the current weeks' "Optician" must reach this office on the Tuesday morning preceding publication.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

FINEST
ROUGH CYLINDER BLANKS,

Also good 2nd Selection
A very attractive proposition for Export and cheaper work.

CHANCE'S GLASS USED.

ACTUAL MANUFACTURERS
ASSOCIATED OPTICAL WORKS, Ld
5, Queen's Buildings, London, W.1
Near Tottenham Court Road.
No Connection with any other Firm. Telephone: Museum 2216.

C. SWAIN, Ltd.,
51, Strand, London.

A B C Code 5th Ed.
'Phone:—GERRARD 5178. Factory: FOREST GATE.

UNCUT
Sphs
Sph Cyls
Piano Cyls

A.O.C. EDGED
Peris & Bi
Cx & Cc etc.,
at Best Prices.

Canadian Goggles.

American Styles, made in Canada to supply demand for British goods. A full line of colored lensed goggles in metal and zylo frames, with and without leather, metal and collapsible dust shields for motor, motorcycle, all out-doors, all industrial uses.

Send for Catalogs or Samples.

CANADIAN GOGGLE Co.,
Manufacturers,
37-39 King William St., HAMILTON, ONT.

Telephone JAMES B. SLY, Central 10280.
9 & 10, EDWARD ST., WARDOUR ST.
LONDON, W. 1.

To S.M.C., B.O.A. & I.O.O. DIPLOMA HOLDERS
Oak frames and modelled gold Arms for the diplomas The Arms of the S.M.C., City of London, and devices of the I.O.O., B.O.A. and Ph. Society in water colours, and framed dark oak, with descriptive engraved plate affixed, 27/6 each. Packed and put on rail.



Printed & Embossed Optical Stationery.
Steel Dies for use of Diploma Holders.
Electros of Coat of Arms & Optical Devices.
Engraved Seals, Prescription Forms, Signs, etc.
Price List on application.

Electro No. 12 Price 3/6

The Optician's Handbook.
Price 4s. 0d. Post Free.
An elementary text book required by every student of Optics.
It is an introduction to "The Study of the Refraction of the Eye, its Anomalies and their Estimation and Correction by means of Glasses,
The Hatton Press, Ltd.,
125, Fleet Street, LONDON, E.C.4

BLUE GOLD
Well hardly that, but we can do White or Yellow.
Write for samples and Prices. Rimmed and Rimless. Style and finish guaranteed.
IT WILL PAY YOU.
HAMPTON OPTICAL CO., Ltd.,
28, ESSEX STREET, BIRMINGHAM.

BRITISH OPTICAL INSTITUTE, LTD.,
(College of Optics).
Complete Training for the Sight-Testing Optician.
In addition to the usual Daily Classes and Correspondence Courses, there will commence shortly a series of Special Evening Classes, for those desirous of preparing themselves for any of the Optical Examinations.
A further series of Weekly Evening Lectures, and Demonstrations, for candidates for the F.B.O.A. Examination, and for post-graduates, has also been arranged.
Vacation Classes.
From July to October a series of Vacation Classes will be held for those who wish to widen their knowledge—not necessarily with a view to sitting for any examination.
The whole work of the Institute is carried out under the supervision of the Principal, assisted by Mr. G. W. Colebrook, F.B.O.A., F.S.M.C., (Master's Prizeman).
For full particulars apply to:—The Principal, Dr. MAX COQUE, B.Sc., Fern Lodge, 20a, Grove Road, Brixton, S.W.2
Telephone: Brixton 677.

F. BARKER & SON, LTD.
SUNDIAL HOUSE,
12, Clerkenwell Road, LONDON, E.C. 1
Registered
LONDON
Trade Mark
Estab. 1848
MANUFACTURERS OF ALL CLASSES OF
SCIENTIFIC AND OPTICAL GOODS.
MANUFACTURERS OF
Aneroid Barometers, Compasses, Drawing, Mining, Surveying & Scientific Instruments of Every Description.
Illustrated and Descriptive Catalogue Post Free to any part of the World. Illustrated Booklet upon Sundials, Barometers and Compasses, Post Free. LISTS FREE.
Correspondence Invited. Bankers' and Trade References.
CLINICAL THERMOMETERS A SPECIALITY

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

WANTED, one or two good second-hand trial cases. Full particulars to P.L.L., 7, Ridgmount Street, W.C.1.

SMALL Wholesale optical factory for sale within two minutes of Farringdon Street, station. Completely equipped, motor power, stones, benches and frame making plant. All in first-class working order. Apply, Box 3478, c/o "The Optician," 125, Fleet Street, E.C.4.

FOR SALE. Stoco Model "A" Auto Edger, two Norton Stones with spindles. Set of cylinder tools, quantity of spherical tools. Box 3481, c/o "The Optician," 125, Fleet Street, E.C.4.

BARGAIN. Standard lens drilling machine, never used, shop soiled. F. Goodman, Chatsworth Road, Luton.

TWO 6-Spindle single surfacing machines, by Sherwood & Co., for sale. Offers to Box 3483, c/o "The Optician," 125, Fleet Street, E.C.4.

FOR SALE. Half-plate stand camera, mahogany, 10" ext. Beck-Steinheil Unofocal Ser. 1., No. 5. *f*/6 with Beck Celverex shutter, T,B to 1/80 sec, 3 mahogany double dark slides, stand, focusing cloth, waterproof case. Offers, lot or separately. Also ½-plate Holborn reflex, magazine 12, Hex. R.R. *f*/77. T and I to 1/100 sec. Leather case. Offers. On appro. on deposit of agreed price with the Publishers of "The Optician." Please address, Box 3475, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

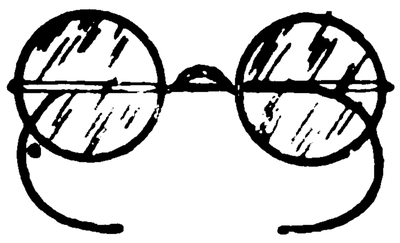
OPTICAL and jewellery business and premises, turnover £1,400. Profits exceed £500. East Lancashire town. Well fitted shop, testing room and and appliances. Commodious living accommodation. Apply, Box 3479, c/o "The Optician," 125, Fleet Street, E.C.4.

SIGHT-TESTING Optical business, two branches, main London thoroughfares. Small power factory fully equipped. Annual turnover £2,850. Can be doubled. Large profits. Complete investigation. Price £1,800 cash. Write, Box 3480, c/o "The Optician," 125, Fleet Street, E.C.4.

SMALL Sight-testing business wanted, seaside, no lock-ups. Box 3482, c/o "The Optician," 125, Fleet Street, E.C.4.

PERCY S. DE SAULLES.
Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES.
Micro Cover Glasses, Glass Cells and Cavity Slips, etc.
The Platts, Amblecote, Stourbridge.

OPHTHALMIC AND SCIENTIFIC
MOULDINGS
Supplied in any Curvature and Glass.
CROOKES A SPECIALITY.
REYNOLDS & BAILEY, 15-19, VINE ST.,
LONDON, E.C.1



OPTICAL BLOCKS
To illustrate all features of Optical Service. Write for Lists.
CHEMISTS' DESIGN SERVICE,
12, Humberstone Gate, LEICESTER.

C. BAKER 244 HIGH HOLBORN LONDON
Estab. 1765
Sight Testing Apparatus
of all descriptions
SECOND-HAND
Fully Guaranteed.
WRITE TO-DAY FOR SECOND-HAND LIST.

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
G. C. DYMOND. M.I.Mech.E., F.I.C.P.A.
W. P. THOMPSON & CO.,
12, CHURCH STREET, LIVERPOOL.
Chartered Patent Agents.
H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and AERONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
ESTABLISHED 1878 TELEPHONE CITY 419

SPECTACLES & EYEGLASSES,
Their Forms, Mounting and Proper Adjustment
by R. J. PHILLIPS, M.D.
Fourth edition revised with 56 illustrations.
Price 6s. 6d. Post Free 7s.
THE HATTON PRESS, Ltd., 125, Fleet Street, London, E.C.4

The Optical Society.

President: Mr. R. S. WHIPPLE, M.I.E.E.
Vice-Presidents: Prof. FREDERIC J. CHESHIRE, C.B.E., Director of the Technical Optics Department of the Imperial College of Science and Technology, South Kensington; Sir HERBERT JACKSON, K.B.E., F.R.S.
Hon. Treasurer: Mr. I. G. AITCHISON, B.A., LL.D.
Hon. Secs.: Mr. L. C. MARTIN, B. Sc., Imperial College of Science and Technology, South Kensington S.W.7 and
Papers' Secretary: Mr. F. F. BRYSON, M.A., B.Sc.

The Society of Chemist-Opticians.

President: Mr. F. S. HORSEY
Vice-Presidents Mr. FOURACRE.
Hon. Secretary: Mr. J. HARCOMBE CUPP, Friern Barnet Rd. New Southgate, N. 11 Telephone Finchley
THE SUPPORT OF ALL CHEMIST-OPTICIANS IS EARNESTLY INVITED.

Midland Optical Society.

President Dr. G. A. SHAKESPEAR, D.Sc., M.A., Acting Professor of Physics, Birmingham University.
Vice-Presidents: W. B. CHARNLEY, Leicester; W. T. COMER, Walsall; H. L. TAYLOR, Birmingham.
Hon. Treasurer: JAMES LUCKING, Birmingham.
Hon. Secretary: JOHN C. ROLSTON, 36, Trafalgar Road, Cape Hill, Smethwick, Birmingham.
Anyone interested in the science of optics and residing Midland is heartily invited to join.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Key to Successful Business is the Trade Paper.

If you advertise, the trade paper gives you a 100 per cent. market; all the readers have a direct business interest in your goods, there is no waste circulation.

If you subscribe, it gives you the latest trade news and technical information. To-day, it is more necessary than ever to be up-to-date in your business; the trade paper will keep you posted. Here are some progressive journals which offer you valuable service as an advertiser, or as a reader.

Aeroplane (London).
Agricultural Gazette (London).
Art Trade Journal (London).
Auto-Cyclist (Sydney).
Automobile Engineer (London).
Auto-Motor Journal (London).
Baker's Confectioners' and Caterers' National Association Review (Lond.)
Bioscope (London).
Box Makers' Journal (Manchester).
Brewers' Gazette (London).
Brick and Pottery Trades' Journal (London).
British and Colonial Mineral Water Trade Journal (Cardiff).
British and Colonial Pharmacist (London).
British Baker (London).
British Builder (London).
British Journal of Photography (London).
Chemical News (London).
China Clay Trade Review (London).
Confectionery Journal (London).
Cooper's Vehicle Journal (London).
Corn Trade News (Liverpool).
Dairy & Creamery Journal (London).
Dairyman (London).
Decorator (London).
Drapers' Organiser (London).
Electric Vehicle (London).
Electrical Industries and Investments (London).
Electricity (London).
Electrics (London).
Engineering Production (London).
Engineering Review (London).
Engineering World (Manchester).
Fancy Goods Record (London).
Fertiliser and Feeding Stuffs Journal (London).
Flight and The Aircraft Engineer (London).
Footwear Organiser (London).
Freemason and Masonic Illustrated (London).
Furnishing Trades' Organiser (London).
Furniture Record and the Furnisher (London).
Games and Toys (London).
Gas and Oil Power (London).
Hardwareman and Ironmonger's Chronicle (London).
Ice and Cold Storage (London).
India Rubber Journal (London).
Indian Industries and Power (Bombay and Calcutta).
Indian Medical Gazette (Calcutta).
Indian Motor News (Bombay and Calcutta).
Indian and Eastern Engineer (Calcutta).
Journal of Decorative Art (Manchester).
Licensing World (London).
"Locomotive" & Railway Carriage and Wagon Review (London).
Managing Engineer (London).
Marine Engineer & Naval Architect (London).
Mechanical World (Manchester and London).
Milling (Liverpool).
Model Engineer and Electrician (London).
Motor Cycle and Cycle Trader (London).
Motor Export Trader (London).
Motor in Australia (Sydney).
Motor Magazine of Canada (Toronto)
Motor Trade of Canada (Toronto).
Motor Trader & Review (London).
Motoring in South Africa (Cape Town).
Motorist & Wheelman (Perth, W.A.).
Music Trades Review (London).
N.Z. Motor Journal (Auckland, N.Z.).
Optician and Scientific Instrument Maker (London).
Organizer (London).
Outfitter (London).
Paper Box and Bag Maker (London.)
Paper Container (London).
Paper Maker & British Paper Trade Journal (London).
Photographic Dealer (London).
Power Laundry (London).
South African Motorist (Johannesburg).
South Australian Motor (Adelaide, S. Australia).
Sports Trades Journal (London).
Stationery World and Fancy Goods Review (London).
Steering Wheel (Brisbane).
Stone Trades' Journal (London).
Sugar Journal, International (London).
Talking Machine News (London).
Textile Manufacturer (Manchester).
Textile Mercury (Manchester).
Textile Recorder (Manchester).
Toyshop and Fancy Goods Journal (London).
Waste Trade World (London).
W.A. Motorist (Perth, W.A.).
Wireless World (London).
World's Carriers' & Carrying Trades' Review (London).

The address of any Paper in this list may be obtained from the Secretary of the

British Association of Trade & Technical Journals, Ltd.,

Sicilian House, Southampton Row. **London, W.C. 1** **Telephone No.: Holborn 395**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

A.—Advertisements unaccompanied by cash cannot be inserted. *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

QUALIFIED Optician required as manager. Apply, stating age and experience to G. C. Bateman, 5, Chobham Road, Woking.

CAPABLE Surfacer, single, disengaged, seeks situation. Any locality, moderate wages. Apply, W. Collett, Dunton Green, Kent.

POSITION required by experienced sight-testing assistant (21) with photographic experience. Competent and careful tester. Disengaged. Reply, J. W., 15, Freme Street, Everton Road, Manchester.

LAD Wanted, about 18, to do small repairs and make himself generally useful. W. Heywood, D.B.O.A., F.S.M.C., 81, Davies Street, London, W.1.

SMART Assistant for front counter, must be good frame fitter and adjuster, well up in photography and with undeniable references. Address, giving full particulars of experience, age, height, etc., to Mr. Reid, 2 & 3, Queen Street, Exeter.

YOUTH, 17, seeks apprenticeship with optician or instrument maker in London. Good references. No premium. J. Applin, 36, Greenham Road, Muswell Hill, N.10.

CAPABLE Refractionist desires change. All-round Rx hand. London or Manchester preferred. Sober, reliable. Box 5678, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION wanted by refractionist, 34, tall, 12 years' London and provincial experience. Enterprising and reliable. disengaged. Box 5677, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST seeks position where further instruction could be gained in ophthalmoscopy, etc. Well up at repairs, fitting, etc. Moderate salary. Box 5676, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Lady, age 20, seeks situation as invoice and accounts typist, 3½ years' experience, excellent references. W.W., 52, Fitzroy Road, Regent's Park, N.W.1.

OPTICAL. Refractionist, holding S.M.C. or B.O.A. diploma required for high-class British firm in the East, age 25 to 33, single. Excellent opening. Write, giving full details of experience to Box 1064, Willings, Moorgate Arcade, E.C.2.

F.S.M.C. desires position with good optician, London preferred. Good appearance and has good photographic experience. Age 24. Apply, Box 5671, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN with thorough experience of sight-testing and photography, requires position. Entering B.O.A. exam. in November. Age 28. Box 5669, c/o "The Optician," 125, Fleet Street, E.C.4.

"ONLY in experience is there truth (Kant)." Manager, qualified, 12 years' experience desires permanency. Box 5668, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, situation as first-class all round gold worker and jobber. Good references. Address Box 5667, c/o "The Optician," 125, Fleet Street, E.C.4.

LADY Refractionist, qualified, requires post, fully experienced. North preferable. Box 5658, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. 30 years of age, with 12 years' pharmacy experience, requires position with optician or chemist-optician. Good salesman and good references. Box 5670, c/o "The Optician," 125, Fleet Street, E.C.4.

TECHNICAL assistant, disengaged, requires position. Scientific instrument trade or otherwise, 12 years' general experience. Would consider representation or showroom. Box 5673, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, two competent refractionists used to management. Apply Heaton Caflin, 23, Chapel Street, Edgware Road, N.W.1.

POSITION required by young man, 28, as manager or first assistant, 10 years' experience. Good salesman. Capable in all cases of refraction, both S. & O. Apply, Box 5666, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUTH, age 18, just left school, passed senior Oxford Local Examination, 1920, desires apprenticeship with good class optician. Midlands preferred. Apply, T. J. Boulter, 82, Barbourne Road, Worcester.

SIGHT-TESTING optician, extensive experience, good retinoscopist and salesman, thoroughly practical and reliable, disengaged. Reply, Optician, 49, Hazlewood Avenue, Newcastle-on-Tyne.

TRAVELLER, optical, with connection on South ground seeks engagement. Box 5661, c/o "The Optician," 125, Fleet Street, E.C.4.

SHELL spectacle maker. All round situation required. Write S. Clarke, 37, Millais Road, Leytonstone, E.11.

POSITION wanted by qualified assistant, capable of taking charge. Within 20 miles Walsall preferred. Box 5674, c/o "The Optician," 125, Fleet Street, E.C.4.

SPECTACLE lenses can be made in mass to show a profit. I am prepared to open a factory for you on small outlay, or shall I run your plant and increase output or quantity? Apply, Box 5675, c/o "The Optician," 125, Fleet Street, E.C.4.

PARALLEL Plate, prism and lens surfacer requires situation, 7 years' first-class experience. Sparke, 49, Manbey Grove, Stratford, E.15.

YOUNG Lady seeks position in retail optician's. Thoroughly experienced in all prescription work, checking, measuring, fitting, adjusting, knowledge of glazing, drilling and rimless fitting. Several years' West End experience. London, provinces, or would consider offer abroad. Box 5659, c/o "The Optician," 125, Fleet Street, E.C.4.

SCIENTIFIC and Mechanical engineer requires situation, home or abroad. Thoroughly experienced in all optical instruments and machines. Capable draughtsman designer. Box 5662, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, work for small engineering and drawing office concern. Optical instruments and machines a speciality. Box 5663, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. D.B.O.A., seeks London engagement, 6 years' workshop and consulting room experience. Accustomed to checking and general supervision. Apply, "Toric," 59, Eden Street, Kingston-on-Thames.

REFRACTIONIST, 33, tall, smart appearance, with long sight-testing and practical experience (London and Provincial) requires situation as branch manager or assistant, excellent references. West of England or South Wales preferred. "Trolos," 22, Toronto Road, Horfield, Bristol.

GLAZIER (Male), requires job or would be useful at shell work, etc. Apply, P., 20, Compton Buildings, Goswell Road, E.C.1.

JUNIOR (D.B.O.A.) seeks position in good house (Liverpool or district preferred). Good refractionist, all repairs, mounting and soldering. Smart address. 5 years' experience. Disengaged early October. Box 5651, c/o "The Optician," 125, Fleet Street, E.C.4.

Concluded on page 2.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE

U.K. TORIC LENSES.

We beg to announce that in future we propose making our FINISHED TORICS Base + 6.0 with MINUS as well as PLUS cylindrical power. That is to say our Base + 6.0 Torics will be worked in two forms.

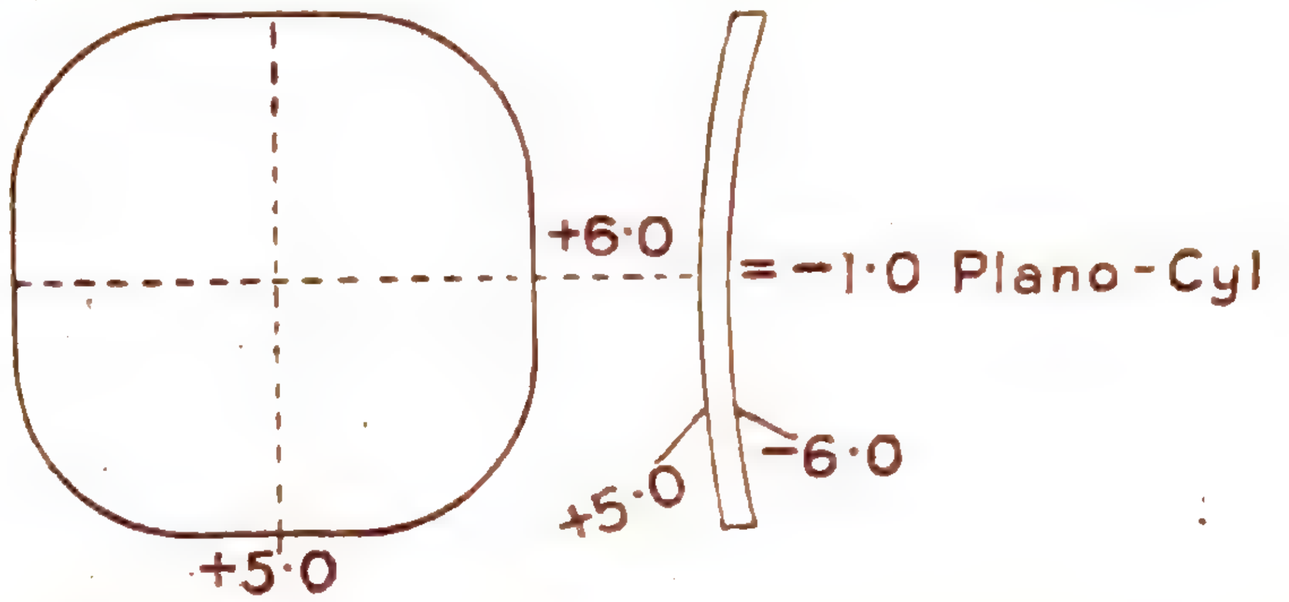
(1) Torics for PLUS combinations will have the Toric surfaces with the curve in one meridian + 6.0 and the curve in the other meridian deeper according to the (+) cylindrical power.

(2) Torics for MINUS combinations will have the Toric surfaces with the curve in one meridian + 6.0 and the curve in the other meridian shallower according to the (−) cylindrical power.

The advantages are that MINUS lenses will not require to be surfaced on excessively deep concave tools and the axis of the cylinder remains constant with the + 6.0 Base curve.

All Plano-Cylinders whether Plus or Minus will be worked with a − 6.0 spherical surface.

The diagram illustrates the 2nd form and it will be seen that by adding the spherical power required to − 6.0 the correct surfacing tool is given without having to transpose the cylinder.



Convex Toric Blanks can be supplied in either of these forms but unless specifically ordered the + 6.0 and deeper curve will be supplied.

Whilst making this announcement we beg to state that our Concave Torics are only made with − 6.0 Base curve and deeper, until the Cylindrical Power exceeds − 4.0 when we make the Base Curve − 4.0.

A selection from these Toric blanks will permit most Rx to be produced with the best appearance and effect.

UNITED KINGDOM OPTICAL CO., LTD.,

(Wholesale and Export Only.)

MILL HILL, LONDON, N.W.7

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE OPTICIAN
Reg. at G.P.O. as a Newspaper



Your Trusted Advisor.

The United States Bureau of Standards has certified the powers of the Wellsworth Master Trial Lenses, to which all Wellsworth Trial Set Lenses must conform. This together with the fact that every Wellsworth Trial Case is of the highest quality, assures you that the work performed with one of these sets is mechanically accurate.

We especially recommend the Wellsworth No. 2209-1 Trial Case in Oak or Mahogany, both for finish and convenient arrangement. Either will be a beautiful addition to your equipment.

Order Through Your Jobber.

AMERICAN OPTICAL COMPANY LIMITED,
39, Hatton Garden, London, E.C.1

WELLSWORTH

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C.4. (Printed by The Century Press, Fulham.) Sep. 30, 1921.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The
OPTICIAN
And SCIENTIFIC
INSTRUMENT MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1593 FRIDAY, OCT. 7, 1921.

Wellsworth
Fits-U Eyeglass Chains

One of the very popular styles of Wellsworth Eyeglass Chains is that with the Fits-U snap. This style snap is a very simple and effective means of attaching a chain to a rimless lens. In reality it is not a snap at all, but simply a little button no larger than a pinhead, just large enough so that it cannot be pulled through the lens hole. It is so small that it is nearly invisible, and when worn with an ear loop chain is the most inconspicuous of chains.

The quality of Wellsworth "Fits-U" Eyeglass Chains is of the same high character that gives all Wellsworth products their reputation for being unexcelled.

Supplied in Solid Gold and Gold-filled.



The above illustration shows the simpleness and inconspicuousness of Wellsworth Eyeglass Chains with Fits-U snap.

WELLSWORTH

TRADE (A) MARK (Regd.)

OPTICAL PRODUCTS.

AMERICAN OPTICAL COMPANY, LIMITED,

39, Hatton Garden, LONDON, E.C.1

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

GEORGE CULVER LTD

Manufacturing Opticians,

JOBBING AND PRESCRIPTION WORK

ACCURACY,

NEATNESS,

PROMPTNESS

Large and full stocks of English made Lenses of all combinations. Orders can be executed promptly.

OPTICAL WORKS:
WHITE LION STREET,
PENTONVILLE,
LONDON, N. 1

TELEPHONE:
NORTH 369 and 871

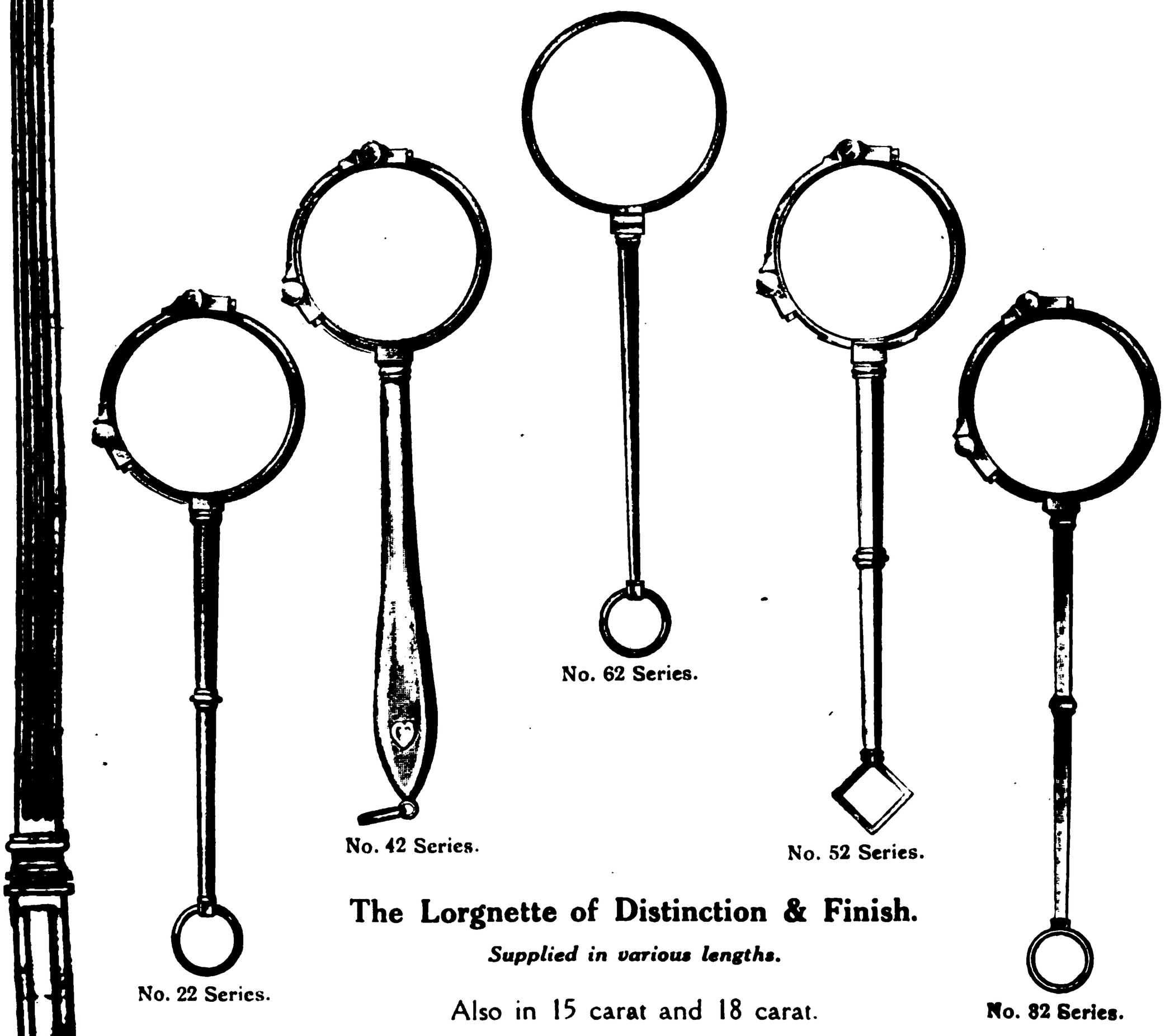
Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

W.H.T.

9ct. GOLD LORGNETTES.

(OUR OWN MANUFACTURE.)



No. 22 Series.

No. 42 Series.

No. 62 Series.

No. 52 Series.

No. 82 Series.

The Lorgnette of Distinction & Finish.

Supplied in various lengths.

Also in 15 carat and 18 carat.

Selections sent on approval.

WALTER H. THOMPSON

66 HATTON GARDEN, LONDON, E.C. 1.

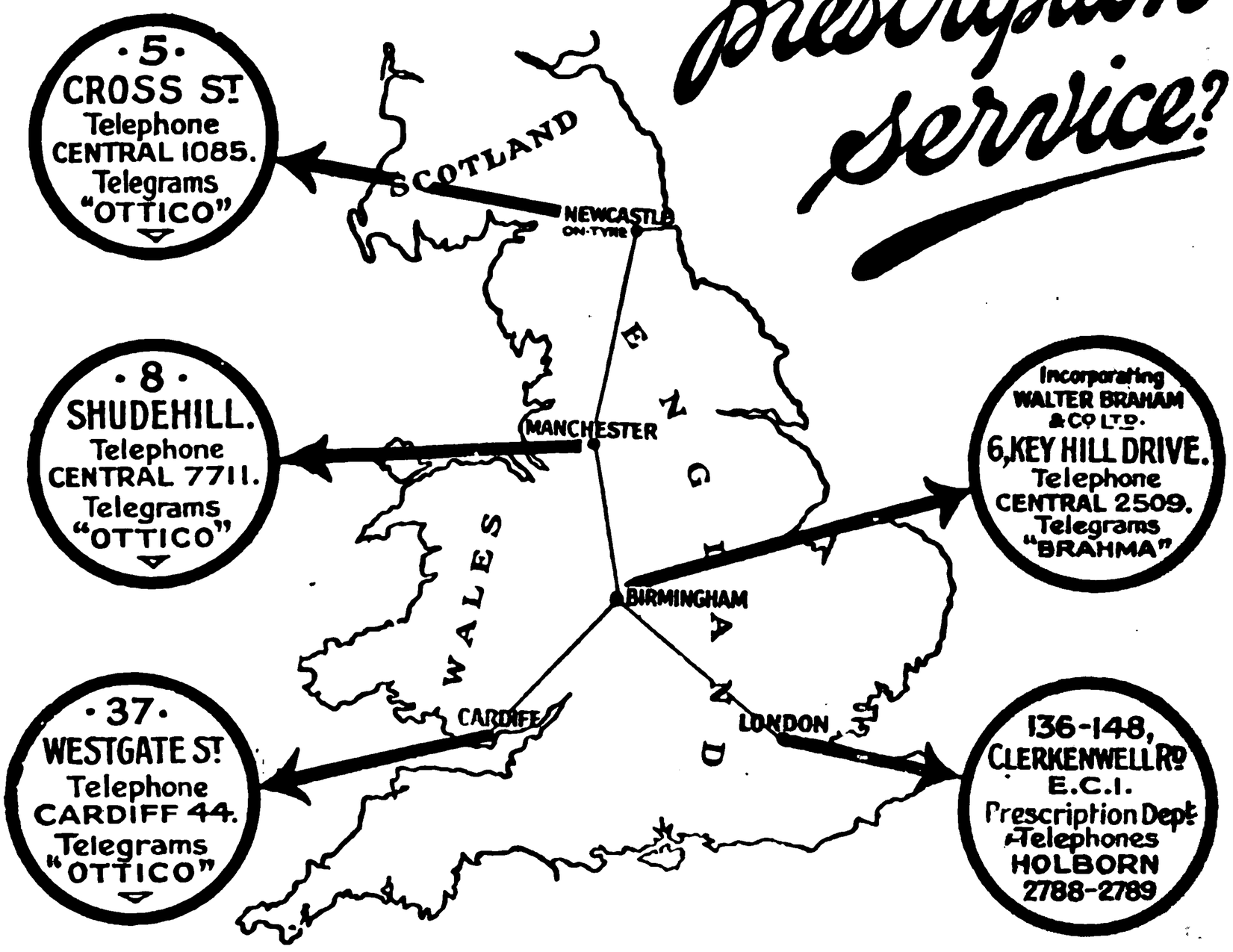
Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

J&R.F.LTD

Why not link yourself with our prescription service?



Each Branch has a Complete Prescription Equipment.

LINK
QUALITY SERVICE
BRAND
Reg[d] Trade Mark.

J & R. Fleming Limited.

136-148. Clerkenwell Road, LONDON, E.C.1.

Telegrams: "OTTICO" SMITH, LONDON.

J&R.F.LTD

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
Col. & Ald. Sir CHARLES C. WAKEFIELD, Bt., C.B.E.

Upper Warden
The Rt. Hon. VISCOUNT HILL.

Renter Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Director of Examinations
The Rt. Hon. Sir WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS

of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., on Oct. 31st, 1921, and during the first week in November.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,593

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices
123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, OCT. 7, 1921.

Wholesale and Export Trade.—With the Key Industries Act import duty now in force, and the imposition of a further equal import duty under the "dumping" provisions of the same Act only waiting for the necessary action to be taken by firms interested, British optical manufacturing industry is set upon the road to a development of both home and export sales for which there has been no similar prospect in the last half-century. Now it remains for those manufacturing firms who claim—rightly as we hope and believe—to be capable of exploiting this new situation to a substantial advantage for the permanent advancement of prosperity in our trade, to see to their factories being set in order, to reduce costs by developing mass production, and not least to advertise their wares, in such sort that all may realise the British optical key industry is a living, and moreover a rapidly expanding, dominant force in the world's markets for all optical appliances. As regards the third of the conditions that our manufacturers have to fulfil if they are going to justify the protection that has been so strongly demanded, and at long last is now given by the Key Industries Act, we are in a position to co-operate with

Digitized by Google Original from THE OHIO STATE UNIVERSITY

them to the fullest advantage for all parties. Our advertising columns reach the import merchants and other buyers in all parts of the world. Our special autumn campaign is made through the semi-annual Special Issue, which will be published on the 28th of this month. We shall be glad to hear from all intending advertisers in that issue, and to receive copy for proofing at their very earliest convenience.

* * *

The Thomas Young Oration.—We had the pleasure of meeting this week, Dr. Chas. Sheard, of the technical staff of the American Optical Co., Southbridge, Mass., U.S.A. Dr. Sheard is in London by invitation, for the purpose of delivering the Thomas Young Oration before the Optical Society; and he will afterwards lecture before several other optical bodies as mentioned in our leading note last week. British opticians should not fail to attend in large numbers to welcome Dr. Sheard, and learn most interesting new facts and suggestions from his discourse on "Some Physical and Physiological Relationships between Radiant Energy and the Visual Apparatus and Processes." As Dr. Sheard, by his research work and his many technological publications, has won a position at the head of scientific optometry in the U.S.A., his account of his investigations and conclusions will be received with much pleasure in wide circles among the opticians of this country. Dr. Sheard is the editor of the 'American Journal of Physiological Optics'—a publication issued by the American Optical Company, which has at once attained in our opinion the position of the premier monthly journal of ophthalmology in the world. Many articles from Dr. Sheard's pen have been reproduced in our columns; and in that way alone he is well-known to and esteemed by our readers.

* * *

Aggressive Advertising.—From several correspondents we have received complaints as to some advertising matter which appeared in the last issue of this paper, and is said to be objected to by many. In one instance a correspondent accredits this matter to *The Optician and Scientific Instrument Maker*, as if we were either responsible or vouched in any way for the accuracy of the statements made. That is, of course, a damaging suggestion to make against any newspaper—to assign to it as an organ of opinion, the responsibility for statements published in the advertisement columns, with which statements it does not follow from any usage in journalism that the editorial views are in agreement. Other writers, however, without libelling *The Optician* by attributing to it expressions culled from advertisement matter in its pages, lay down the proposition that it is our duty as publishers to investigate and approve all that appears in our advertisement pages. That is a proposition which no industrial newspaper proprietor or editor would for a moment admit. There is only one censorship of advertisers' copy which is due, and that is to exclude anything of an individually offensive or libellous nature. We go a little further ourselves and, in the interest and at the request of members of the trade, cut out such matters as wholesale prices on ophthalmic ware, etc.; but that has nothing whatever to do with the matter in issue.

* * *

Competitive activities between parties engaged in the optical business are not a matter for control by the publishers of this journal. At the same time we regret very much that a feeling of soreness has been occasioned in this instance; and we hope that we shall not again be the innocent means of bringing about such criticisms as are in the correspondence before us. Some of the letters are exceedingly biting and clever, but written over a pseudonym; and in accordance with a rule which has been in force for a long time, we cannot publish anything of the character of a personal attack in that form. Other letters contain remarks which are libellous, whether true or not, and cannot therefore be printed in any case. On the merits of all of them, we have only to add that *The Optician* is printed for the trade and not for the public; and our readers are quite capable of estimating the face value of any advertiser's claims.

Removal.

Messrs. Joseph Casartelli & Son announce to their friends in the trade, that owing to the expiration of their lease and the sale of the building to fresh owners, they are compelled, after a tenancy of upwards of 80 years, to give up possession of the premises at 43, Market Street, Manchester. On and after the 10th inst., this old-established business will be transferred to new premises, 18, Brown Street, opposite the General Post Office, Manchester, to which address all correspondence and parcels should be directed on and after the above date.

Matter intended for the current weeks' "Optician" must reach this office on the Tuesday morning preceding publication.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

An 'Object-Image' Chart for Lenses and Mirrors.

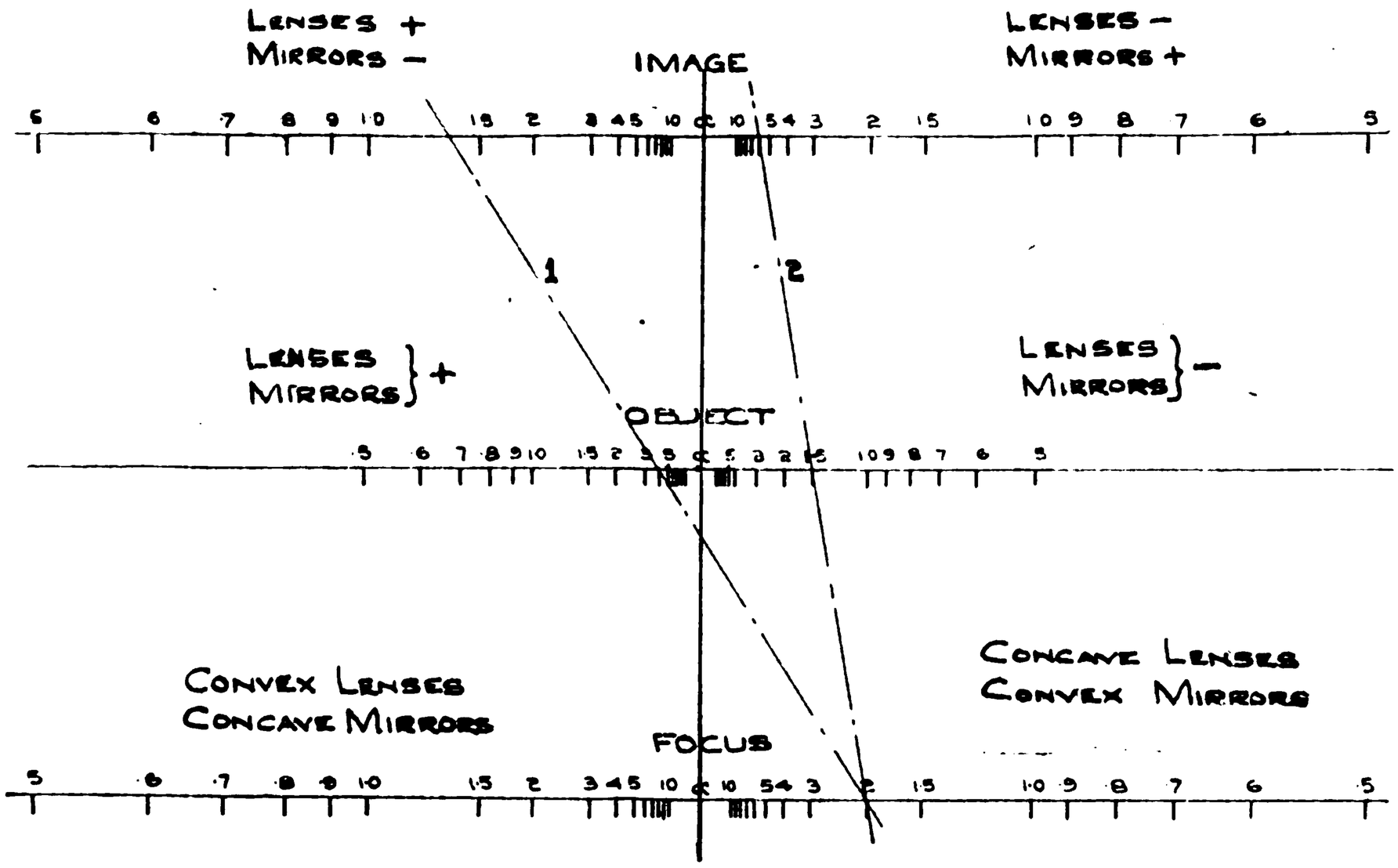
By C. F. SMITH.

The chart or diagram which this article is intended to illustrate is of the type which has proved so useful in embodying formulæ used in engineering problems. It occurred to the writer that the familiar formula "$\frac{1}{f}=\frac{1}{u}+\frac{1}{v}$" could be expressed in this form, and the result forms an interesting companion chart to that described in the issue of this journal of December 10, 1920. Such graphical means are of assistance in roughing out optical systems and in quickly determining foci and distances in experimental work. The above formula is essentially an addition or subtraction of reciprocals, and it is apparent that these operations can be expressed in a linear form.

In the chart, therefore, an image distance (or focal length) of say 2 units is plotted in terms of its reciprocal—*i.e.* 0.5 units—and so on for other values. The scale of the 'object' line depends on the position relative to the 'focus' and 'image' lines, and is obtained by taking the 'α' on the 'image line' as the radiating point of lines drawn to the divisions on the 'focus' line. The points of intersection of these lines with the 'object' line then take the same values as the divisions chosen on the 'focus' line.

The system leads to a minor difficulty in lengths such as 0.2 units, as in this case its reciprocal becomes 5, the result being that the spacing for the larger distances becomes rather cramped. If, however, one decides to stop at a length of 0.5 units, the scale is quite reasonable and there is always the possibility of multiplying the terms by 10 and using the higher numbers of the chart. It then remains to arrange the chart to be suitable for both lenses and mirrors, either convex or concave. The wording of the chart should make things clear: in the case of the 'object' and 'image' lines the signs + and − indicate positions on the 'incident' and 'non-incident' sides respectively of the optical elements.

In No.1 of the examples shown, a lens is concave and of focal length equal to 2 units. The object is a distance of 4 units in front of the lens, and the resultant image is formed 1.33 units also in front. In example No.2 with the same lens, the object is supposed to be projected (as a part of a system) a distance of 1.5 units behind, and the image is formed 6″ on the same side of the lens.



It must of course, be understood that the formula and chart always refer to thin lenses or to the principal planes of thick lenses.

B

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Radiations, Illumination and Colours.

By Dr. MAX COQUE, B.Sc.

1—RADIATIONS.*

We may, therefore, say that these various classes of ether waves differ from each other only in the same sense in which a deep musical sound differs from a high pitched one; the difference is merely one of wave-length or frequency.

On the other hand, the curious radiations discovered by Rontgen and termed by him *x*-rays most probably consist of ultra-violet radiations of extremely short wave-length, and this very peculiarity explains why the radiations in question differ by some of their properties from those of the other groups. For instance, it is extremely difficult to make *x*-rays exhibit phenomena of interference but this may be due to the fact that since the wave-lengths of the *x*-rays is extremely small, the interference bands may be too narrow to be seen. Again, *x*-rays are easily diffused but not easily regularly reflected. We shall point out later on that the smoothness of a surface necessary to produce regular reflection depends on the wave-length of the radiation employed or more exactly, on the relative size of the wave-length and of the surface irregularities. If the wave-length is appreciably larger than the surface irregularities, there is regular reflection; if appreciably smaller, the waves are broken up by the irregularities or roughness of the surface and there is diffusion or scattering. For instance, ground glass is not smooth enough to reflect regularly the visible radiations but it does reflect regularly the long infra red waves because the wave-lengths of the latter are large and those of the former small as compared to the size of the surface irregularities. It is not astonishing, therefore, to find that the exceedingly small wave-lengths which give rise to *x*-rays cannot easily be regularly reflected but are readily diffused.

To revert now to the ether waves set up by the sun or by other sources of light, we have shown that the waves of longer duration or of greater wave-lengths give rise to the calorific phenomena observed in the infra red spectrum. Those of shorter duration or shorter wave-lengths give rise to the chemical or actinic phenomena observed in the ultra-violet spectrum. As to radiations of intermediate wave-lengths, they produce luminous and variously coloured sensations, as well as calorific phenomena in the part of the spectrum near the red end and chemical phenomena in the part near the violet end. It is convenient to give the name of complete spectrum to the region in which a beam of solar rays, after it has passed through a prism, produces an effect calorific or luminous or chemical. The portion in which a luminous effect is produced is termed the luminous or the visible spectrum; the portion in which calorific effects without luminous effects are produced is termed the dark calorific spectrum or the infra red spectrum; the portion beyond the violet in which chemical effects only are observed is termed the dark chemical spectrum or the ultra-violet spectrum.

It must be understood that the limits between these various portions of the spectrum are not rigidly fixed and may vary a little in the case of different observers and even for a particular observer, with the conditions in which his vision takes place. Thus, the visible part of the spectrum, which under ordinary conditions is limited by the lines A and H (1)

*Concluded from page 86.

(1) We have said at the beginning that the solar spectrum is not absolutely continuous but presents a number of dark lines. These lines had not escaped Newton's attention, but he attributed their existence to some defects in the transparency of his prisms and lenses. It is Fraunhofer who recognised the true nature of the phenomenon and explained its production.

If a spectrum is obtained with an electric arc lamp as source of light, it differs from the solar spectrum in the fact that it is perfectly continuous and does not show any of the dark lines we mentioned just now. On the other hand, if we use as source of light a spirit lamp, in the spirit of which a little common salt has been dissolved, the spectrum is reduced to a bright yellow line or more exactly to two yellow lines so close to each other that a high resolving power is necessary for them to be seen as two separate lines. Experiment shows that every chemical element in the gaseous state, when rendered luminous, gives rise to a characteristic spectrum, but in very few cases is the spectrum obtained as simple as that of sodium. Thus, the spectrum of strontium has several red lines and a blue line which explain the crimson colour of the strontium flame. The spectrum of hydrogen consists of a number of coloured lines, and the iron spectrum has such a vast number that the light emitted appears to the eye to be white. The spectrum of thallium consists of a single green line. The bright lines produced by any chemical element have characteristic places in the spectrum so that by observing a spectrum, the substance which gave rise to it may be identified. This process is known as spectral analysis and is generally carried out by means of a spectroscope.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

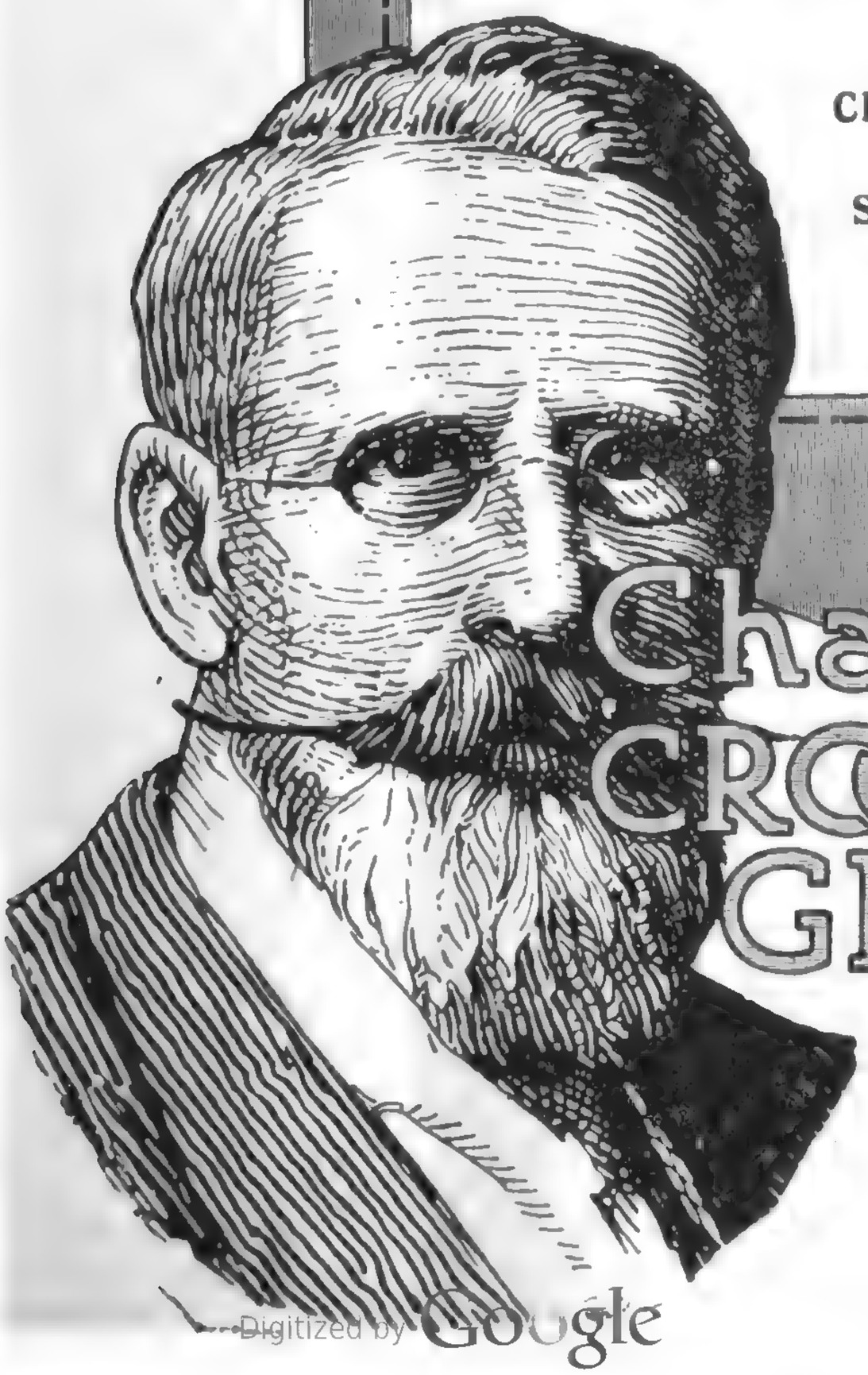
Reasoned Publicity

The readers of "local papers" respond to good advertising no less than the readers of the most famous periodicals; and they are equally appreciative of well designed illustrations and neat display. For this reason (and because the Optician is often his own publicity adviser, but cannot always spare the time necessary to design telling layouts) we have had prepared a special series of small-space advertisements to be used with the Optician's name and address. These are ready in type (name and address only requiring to be added) and a good display is assured. You can secure free, by writing to us, advertising matter of a quality which would be very expensive if you procured it independently.

We can sincerely recommend to all progressive Opticians this series of advertisements.

A line to us will bring you all information.

CHANCE Bros. & Co., Ltd.
Glass Works,
Smethwick, Birmingham.



Chance's
CROOKES'
Glass

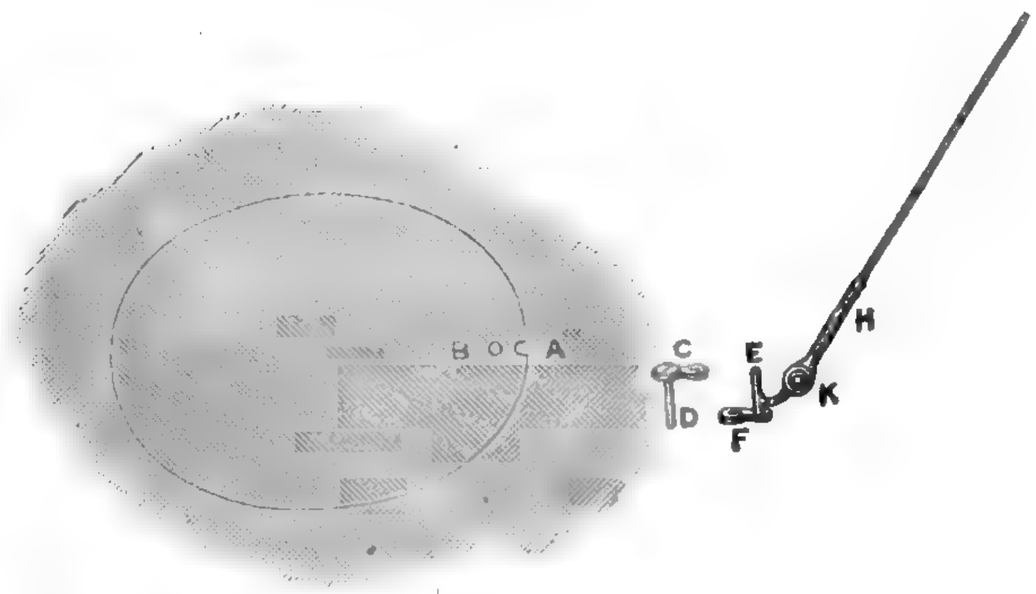
AN INSTRUMENT IS NOW ON SALE TO DEMONSTRATE TO THE PUBLIC THE EFFICACY OF CHANCE'S 'CROOKES' GLASS IN CUTTING OFF THE HARMFUL LIGHT RAYS

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Phone:—City 3225 (3 lines) *Telegrams:—Bulford, BARB. London.*

PATENT "INVISO" REG.D MOUNTINGS

THE Patent **"Inviso"** method of attaching the mountings to the lenses lends itself to extreme lightness. This makes itself apparent in a marked degree in Spectacle mountings, since it obviates the placing of a bearing part of metal against the edges on the lenses, as in the regular form of fitting.



A—Slot in Lens. B—Hole in Lens. C—Loose Strap sliding on E.
D— Screw passing through Lens in fixed Strap F. K—Joint. H—Cable Curlside.

In illustration of lens it will be noted that a narrow slot **A**, is made in the lens parallel with the hole B, into which the fitted E sinks (Pat. No. 21944). Our patent No. 14838 also provides for a movable strap C so that the lenses of different thickness can be fitted. This in itself is a great advantage over the regular mounts, which being rigid cannot be fitted with the accurate precision which is so necessary when dealing with lenses of so many different thicknesses, which so often, are between the regular sizes made. The **"Inviso"** loose strap overcomes this and moreover a contact fit is made in all cases. The illustrations show the lightness and neat appearance over the regular form in use.

Made by the firm whose Reputation for Prescription Work is:—*"Second to None."*

NEWBOLD & BULFORD, ***Prescription House,***
GOSWELL ROAD, LONDON,
E.C.1

Digitized by Google Original from THE OHIO STATE UNIVERSITY

may in the case of some observers, extend further away on both sides or fall short of the limits stated just now; these individual differences are, however, slight at least in the case of persons with normal colour vision. It has been found by Helmholtz that under special experimental conditions, the visible part of the spectrum extends for a certain distance into the ultra-violet region; he received the ultra-violet part of the solar spectrum on a slit cut in a diaphragm and made it fall upon a second prism so as to exclude all extraneous elements by a new refraction and he observed then that the eye could then appreciate a portion of the ultra-violet radiations, from the line H to the line R, as a lavender-hued sensation.

The portion of the spectrum which the average human eye perceives as coloured consists of radiations the wave-lengths of which decrease gradually from 712 $\mu\mu$ (line A) to 393 $\mu\mu$ (line H). The ultra-violet portion which is faintly visible as lavender when all the rest of the luminous spectrum is cut out lies between 393 $\mu\mu$ and 320 $\mu\mu$ (line R). The whole of the visible spectrum thus occupies a less interval than a complete octave. We may, therefore, conclude that the visibility range of the ether radiations is much smaller than the audibility range of air waves set up in the atmosphere by the vibrations of ponderable bodies, as we shall see by and by.

On what does the invisibility of the radiations of the infra red and of the ultra-violet regions of the spectrum depend? There are obviously two possibilities. Either the radiations in question are absorbed by the refracting media of the eye and do not, therefore, reach the retina, or the infra red radiations are too slow and the ultra-violet too rapid to excite the sensitive elements of the retina.

The latter assumption is all the more defensible that it holds good in the case of our sensations of sound. Though a sensation of sound is due to air waves transmitting to the nervous organs of our internal ear the energy of a vibrating body, yet all such vibratory movements do not give rise to a sensation of

---

It is a general rule that any gas or vapour will absorb, at all temperatures, the particular kind of radiations which it itself emits at high temperatures. Thus, if a spectrum is formed by means of an electric arc lamp, this spectrum is continuous and free from dark lines. If however, the beam of light is made to pass through a sodium flame, before it is allowed to pass through the prism, a dark line will be observed in the spectrum which was originally continuous. If we remove the arc lamp and use the sodium flame as source of light, the spectrum will be reduced to a bright yellow line in the exact position occupied by the dark line mentioned just now. The reason for this is that the sodium flame is at a much lower temperature than the electric arc and, therefore, does not emit as much of the yellow light as it absorbs from the white light from the arc. A continuous spectrum, with certain characeristic black lines is called an absorption spectrum and from the instance given just now, we can conclude that the absorption spectrum given by any substance is complementary to its own bright line spectrum.

The solar spectrum has an immense number of dark lines or absorption lines which are produced in a manner somewhat similar to that just described. The visible part of the sun, called the photosphere, consists of a luminous mass which emits white light as does an electric arc lamp. Surrounding this nucleus, is the chromosphere which is made up of various chemical elements in gaseous state and at a much lower temperature than the photosphere. Hence, the radiations corresponding to the elements of the chromosphere are absorbed from the white light from the photosphere, giving rise to the dark lines known as Fraunhofer's lines. Many elements such as sodium, iron, hydrogen are known by this means to be present in the sun. Several of the sun's metals, such as caesium, rubidium and thallium have been discovered by their spectra and the metal helium was known to exist in the sun's chromosphere before it was found on the earth. As evidence of the correctness of this explanation of the origin of the Fraunhofer's lines, it may be mentioned that when the moon's disc just covers the photosphere in the event of a solar eclipse, the spectrum of the sun becomes reversed, the chromosphere which is then the source of light producing its own bright line spectrum.

The most prominent of Fraunhofer's lines are denoted by the capital letters of the alphabet. The line A corresponds to a wave-length of 712 $\mu\mu$ and is seen in the extreme portion of the red, very near the limit separating the red of the visible spectrum from the infra red. The line B near the middle part of the red, corresponds to a wave-length of 688 $\mu\mu$; the line C is at the limit of the red and orange (wave-length 656); the line D (Sodium line) is in the yellow (wave-length 589) and so on, up to the line H which is near the violet end of the spectrum and whose position characterises a wave-length of 393 $\mu\mu$.

The ultra-violet spectrum cannot be investigated by simple observations like the visible part but it can be photographed provided the prism and lenses used for the purpose do not absorb waves of short length. Glass appliances are unsuitable because glass, especially heavy flint, is practically opaque to the greater portion of the ultra-violet radiations. Quartz, on the other hand, is transparent for very short waves and a quartz prism is always used in this sort of investigation. It has been found that the atmosphere absorbs ultra-violet radiations and by experiments conducted in vacuo the properties of ultra-violet waves are short as 100 $\mu\mu$ have been observed. Photography shows a considerable number of dark lines in the visible and the ultra-violet parts of the spectrum; we have stated above the position of the most prominent of these lines in the visible spectrum; the series continues in the ultra-violet portion, in which lines K, L, M, N, O, P, Q, R, S, T, have been recorded the last two corresponding to wave-lengths of 310 and 300 $\mu\mu$ respectively.

Similar lines exist in the infra-red part of the spectrum but, of course, they cannot be demonstrated by direct vision or by photography, since infra-red radiations are invisible and have no effect on photographic plates. By means of his bolometer, a most highly sensitive electric thermometer, Langley has investigated the infra red spectrum through a range extending from 760$\mu\mu$ to about 60,000 $\mu\mu$.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

sound. Sound waves must have a frequency greater than about 16 per second and less than 36,500 to cause a sensation in the average human ear. We can put this statement in a different form, as we have already done in the case of ether waves. Since all vibratory movements set up air waves which travel in all directions with a uniform sped of 340 meters per second, it results from what has been said before that the wave-length of a sound the frequency of which is 16 is equal to 340/16 or 21 meters, whereas that of a sound the frequency of which is 36,500 is 340/36,500 or 0.009 meters or roughly 10 m.ms. Hence, the only vibratory movements which can initiate a sensation of sound in the average human ear are those of a wave-length less than about 20 meters and more than about 10 m.ms.; the longer waves produce the sensation of deep sounds, the shorter that of shrill sounds. Thus, the range of sound sensations extends to something like 13 octaves though, in music, excessively low and high sounds are both excluded, the notes usually employed lying within the compass of about 8 octaves, *i.e.*, from a frequency of about 40 to 5,000.

The invisibility of the infra red and the ultra-violet radiations might be explained in a similar way. Exactly as our ear is not stimulated by air waves the frequency of which is less than 16 or more than 36,500, our retina may not be sensitive to ether waves having a frequency less than 420 billions and more than 750 billions. It may be, however, that those ether waves which do not cause a luminous sensation when they strike the eye do not really reach the retina but are absorbed by the dioptric media of the eye.

Selective Absorption.

It has been shown by direct experiments that when radiations pass through a material medium, they lose a part of their energy, *i.e.*, they are partly absorbed, but the energy lost by the radiation generally serving to raise the temperature of the absorbing body. This absorption is slight in some cases, much greater in some other cases, but it is always selective, inasmuch as a particular medium or body may absorb a great amount of some radiations and a small amount of some others. For instance, water absorbs very little the visible radiations of the spectrum though, even in thin layers, it almost entirely absorbs the infra red or calorific radiations. In the same way, glass, ordinary window glass, cuts off, *i.e.*, absorbs much of the infra red radiations; flint glass, which contains lead, absorbs the infra red radiations to a greater extent than ordinary crown glass; the substance called calc-spar cuts off the calorific radiations even more completely than flint glass.

On the other hand, rock salt is one of the substances which is most transparent to infra red radiations whilst quartz is exceedingly transparent to ultra-violet; it is for this reason that lenses and prisms made of rock salt are used in experiments on the infra red portion of the spectrum whereas quartz lenses and quartz prisms are used for experiments on the ultra-violet. Thus, the substances mentioned just now, though transparent in the ordinary sense of the word, *i.e.*, transparent to visible radiations absorb to a greater or smaller extent the infra red or the ultra-violet radiations as the case may be. Other substances, like lamp-black, are totally opaque to visible radiations and transparent to infra red; metallic silver, in exceedingly thin layers does not transmit visible radiations but is transparent to ultra-violet.

Diathermancy of Eye Media.

The media of the eye behave very much like water as shown by Janssen, who experimented on the eyes of various animals, ox, sheep, pig, etc. By means of a thermopile, he measured the amount of heat passing through the various media, the source of light he used being an ordinary colza oil lamp (Carcel lamp). He found that the amount of heat reaching the retina is but 7/100th of that falling on the cornea. On the other hand, according to Melloni's researches, the flame of a Carcel lamp emits infra red and visible radiations in the proportion of 9/10th and 1/10th respectively. It follows that since the luminous radiations reach the retina as shown by the fact that a sensation of light is produced, the absorption must necessarily bear on the infra red radiations.

This is confirmed by the results of Brucke's experiments. He directed a beam of solar light on the eye of an ox and ascertained by means of a thermopile that a small amount of heat passed through the media of the eye and reached the retina. Then, he repeated the experiment after having coated the cornea with a layer of lamp-black, a substance which, as stated just now, is quite opaque to luminous radiations but which allows free passage to infra red or calorific radiations. He found that in these circumstances. the amount of heat reaching the retina is almost but not quite reduced to zero and concluded that the infra red radiations are almost if not entirely absorbed

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE "CARLTON" CASE

(PAT. No. 14064.)

The Rigid Case with a Flexible Gusset.

A CASE FOR SHELL SPECTACLE WEAR
WHICH CAN BE CARRIED IN THE POCKET.

Our sales of this excellent case have. in the short time since its advent, amply JUSTIFIED ITS INTRODUCTION.

Your SALES OF SHELL-WEAR will be Greatly Helped bv same.

A dignified Advertisement for the Optician or Refractionist

A Cleaner that will Lay Tidily in the Case

YPRES-Compactum LENS CLEANER and MOUNT POLISHER.

(CLEAN LENSES ON FABRIC.)

CHAMOIS POLISHING STRIP

Space for Optician's Name

Fold Fabric on Chamois Polisher and the Cleaner will Lay Snugly in Case providing a Cushion for Glasses

∴ MINIMISING BREAKAGES. ∴

Copyright.

"A Ready Means of Keeping Your Name before the Public's Eye"

Samples and Quotations on Application

A NEAT ARTICLE FOR DISCERNING PEOPLE.

NEWBOLD & Co.,

(P. & S. NEWBOLD.)

72 & 74, Gray's Inn Rd., London, w.c.1

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

WHOLESALE TRADE ONLY.

W. Smythe & Co. Ltd.

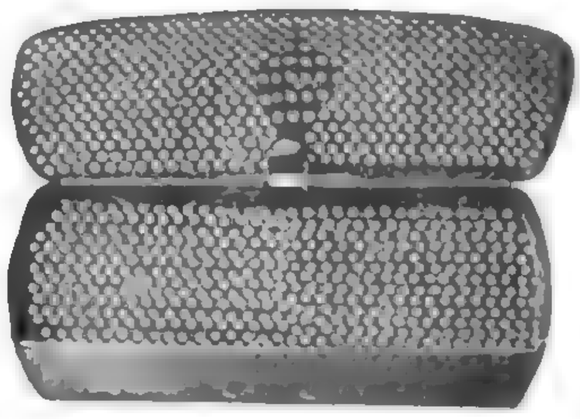
Head Office: 66 and 67, EDWARD ST. PARADE, **Birmingham.**

Branch Works—HOCKLEY and WALSALL.

Patent Optical Case Manufacturers

Telephones: 5587-2354 CENTRAL. Telegrams & Cables: "NOWATE, BIRMINGHAM."

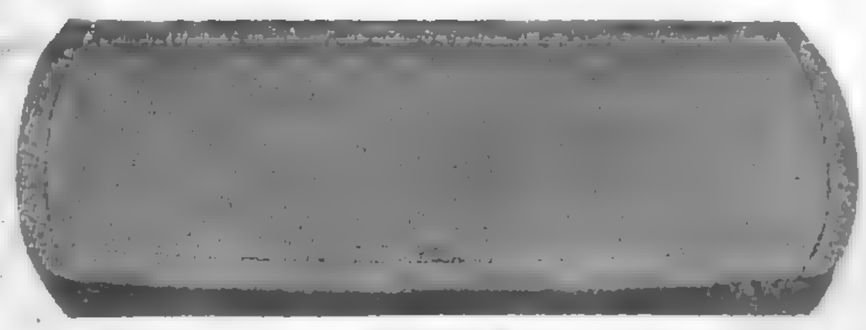
The Patent "NOWATE" Body →



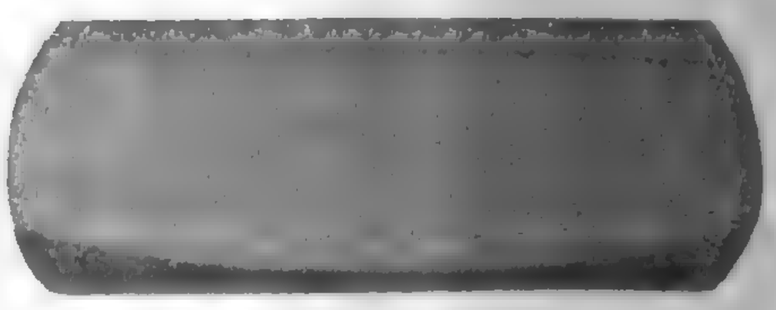
Advantages:

Light as Aluminium and Cheaper.
Stronger than Aluminium and Steel Bodies.
Leather and Lining does Not Peel Off.
Specially Suitable for Export and Hot Climates.

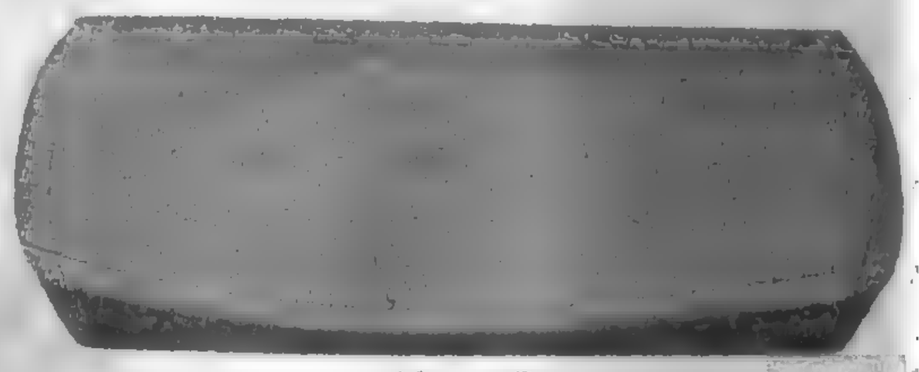
Patent Metal Spring Lid.



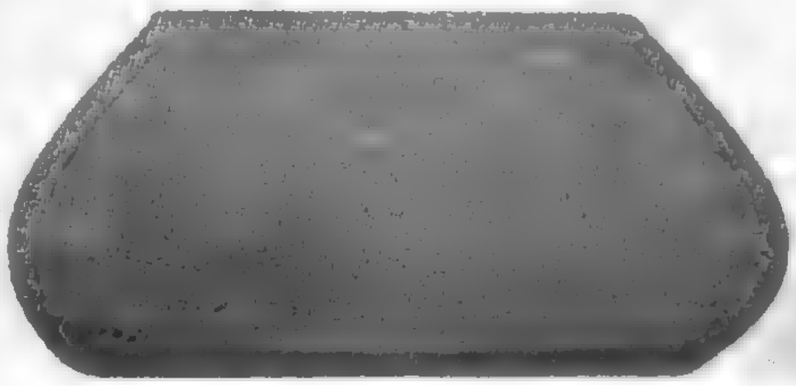
MODEL 5
FINGERPIECE EXTRA LARGE CURLSIDE
2.1.0.EYE



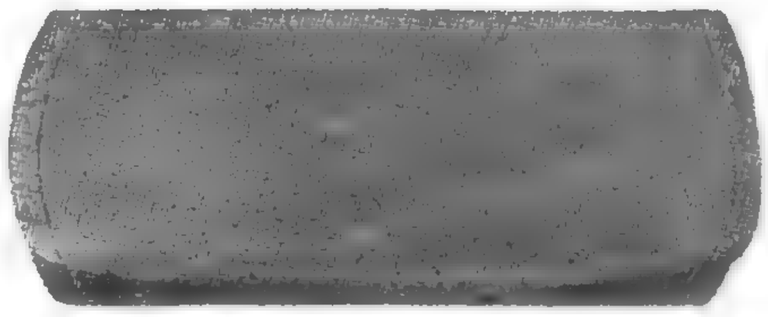
MODEL 4
FINGERPIECE. BOWSPRING RIMLESS
ORDINARY SPIRAL. 2.1.0 EYE



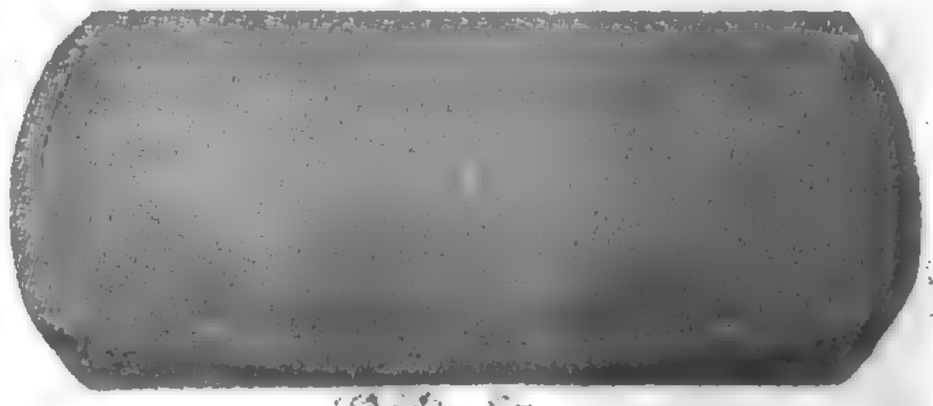
MODEL 3
CURLSIDE 00 EYE. 64 & 66 m/m RD



MODEL 6
FRENCH ASTIG. PERFECTION AND CANADIAN FOLDERS



MODEL 1
ORDINARY SPIRAL TRIPLE BAR 2.1.000 EYE



MODEL 7
ROUND EYE

ILLUSTRATIONS HALF-SIZE. COMPETITIVE PRICES

Also Makers of Frogmouth and Soft Leather Cases. Write for List and Prices.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

by the ocular media, the small amount of heat which reaches the retina being that which is due to the least refrangible of the visible radiations.

A Visibility of the Ultra-Violet.

We have already pointed out that it is not strictly true to say that the ultra-violet radiations do not affect the retina at all. It is so if we deal with a complete spectrum, *i.e.*, a spectrum consisting of the visible and invisible portions; the intense stimulation produced by the visible radiations seems to extinguish the sensation due to the ultra-violet, but if the visible spectrum is eliminated by means of special experimental arrangement and the ultra-violet part only is retained, this part, which was originally invisible, is now seen, the sensations being that of a lavender hue. It would appear from this that those ultra-violet radiations, the wave-lengths of which are a little shorter than that of the violet, give rise to a luminous sensation when received on the retina but that sensation is much weaker than that due to the radiations of the visible spectrum.

Different opinions have been held at different times in regard to the penetrability of the ultra-violet rays through the eye. It is generally accepted now, that these radiations are almost completely absorbed by the crystalline lens. The researches of Chardonnet, which have ben confirmed by Gayet and Widmark showed that subjects who have been operated upon for cataract easily perceive the more refrangible part of the spectrum which is invisible or almost invisible to the normal eye. Thus, the ultra-violet radiations are absorbed by the lens and after removal of this structure they can reach the retina. According to Widmark, the visibility of the most refrangible end of the spectrum extends from radiations having a wave-length of 382 $\mu\mu$ (extreme end of the visible violet) to those having a wave-length of 371 $\mu\mu$ while in the absence of the crystalline lens, the limit corresponds to a wave-length of 313 $\mu\mu$. Beyond this, the ether vibration becomes so rapid that they no longer excite the receptors of the retina just as sound waves that are too short and too rapid fail to throw the receptor of the ear into activity.

The experiments of Regnault had shown, as far back as 1860, that the human crystalline lens is fluorescent. What is the exact meaning of fluorescence?

It has been found by Herschel, Brewster and Stokes that there are a number of solid substances as fluor-spar, uranium, glass, also of liquids, petroleum, solution of quinine sulphate and many of the dye-stuffs derived from coal tar, as fluoresceine, which when exposed to the effect of a beam of invisible ultra-violet radiations produce a beautiful display of coloured lights, the colour of which depends on the substance used. It has been shown by Stokes that fluorescent substances have the property of absorbing the very short waves of ultra-violet and transforming them into waves of longer length which are visible to our eye. Of all substances, the most highly fluorescent is platino-cyanide of barium; in ordinary light it looks like a pale yellow or greenish-yellow powder resembling brimstone. When a sheet of paper, coated with a solution of platino-cyanide of barium, is held in the ultra-violet portion of the spectrum it emits a yellowish green light of extreme brilliancy.

If we produce a spectrum in the ordinary way and project it on an ordinary paper screen, we can ascertain the position of the violet end. If now we place on the screen a strip of paper coated with a solution of quinine sulphate, the spectrum is seen to extend visibly beyond the violet end. With a sheet of uranium glass instead of the quinine screen, we observe a similar but greater extension that makes the previously invisible ultra-violet spectrum seem quite twice as long as the distance separating the red and the violet in the visible spectrum. If finally we replace the uranium glass by a strip of paper coated with platino- cyanide of barium, the fluorescence of that strip extends over a length almost equal to four times the length of the visible spectrum. In the infra red portion of the spectrum, fluorescent substances show nothing whatever; they are excited into luminous activity, not by the long waves of the infra red but only by the short waves of the ultra-violet and they transform these radiations, invisible in the ordinary way, into radiations of longer wave-lengths, *i.e.*, radiations included within the limits of sensibility of the human retina.

Fluorescence of Crystalline Lens.

As already stated, Regnault observed in 1860 that the crystalline lens of the human eye is fluorescent under the influence of ultra-violet radiations and he thought that the phenomenon was due to the absorption of these radiations. This assumption was confirmed by Chardonnet who made use, in his experiments, of the property exhibited by metallic silver in extremely thin layers, to intercept the visible radiations and to allow a passage to the ultra-violet ones. A plate of glass was coated with an extremely thin layer of silver

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

deposited chemically by Foucault's method. This sheet was placed between an electric arc lamp and four different observers, two of them normal sighted, whilst the other two had been operated upon for cataract several years previously. The normal subjects could see neither the carbon pencils of the lamp, nor the arc itself while the aphakic observers had a distinct perception, not of the carbon pencils which emit very little ultra-violet radiations, if any at all, but of the arc which emits a considerable amount of these radiations.

Crystalline Lens Variation with Age.

Similar results were obtained more recently by the Professor Gayet of Lyon, and the absorbing power of the crystalline lens for ultra-violet radiations is perfectly well-established. Gayet found, moreover, that this power of absorption of the lens varies with the age of the subject. He has a series of glass plates so very slightly coated with metallic silver that any one of them would allow him to see faintly the electric arc lamp. By placing two of these plates in contact, he himself just ceased to see the arc, but young men of about twenty could still faintly see it and children of ten or twelve could see it most distinctly. To confirm his results and make sure that the luminous perception obtained in the above experiments were really due to ultra-violet radiations, rendered visible by the fluorescence of the crystalline lens, Gayet interposed a plate of heavy flint in front of the arc lamp; this substance is transparent to the visible radiations of the spectrum, but absorbs the ultra-violet ones to a considerable extent. In these circumstances, the arc became invisible to the young subjects who could still see it before the flint plate was interposed.

From this and from what has been said before, it follows that the retina is really sensitive to ultra-violet radiations within a certain range of wave-lengths and that since in ordinary circumstances it does not react to the stimulation due to those ultra-violet radiations which enter the eye, it is because these radiations are to a great extent absorbed by the crystalline lens and either they do not reach the retina or at any rate, do not reach it in sufficient quantity to stimulate the activity of this membrane.

In a further instalment of this work, we shall investigate the effect of ultra-violet light on the eye from the hygienic standpoint and discuss the advisability of protecting the visual organ against these radiations.

To sum up, ether waves of moderate length alone are capable of exciting the sensory elements of the retina and what we call light and colour depends on the intrinsic property of our receptor apparatus to react to certain wave-lengths only. We could imagine the existence of eyes sensitive, not like ours, to the medium but solely to the extreme radiations of the ether. Such eyes would see the external world under an aspect very different from that in which we see it; the infra red (calorific) or the ultra-violet (actinic) radiations would be perceptible in the form of colours never seen by us and which we are unable to visualise because they are qualitatively different from those which our vision can appreciate.

Before passing to the next part of our subject, namely illumination and sources of light, we give below a table showing the wave-length for the different parts of the visible spectrum, together with that corresponding to the most prominent Fraunhofer's lines which, as stated before, may be regarded as fixed and invariable land-marks. This table will be useful later on for reference purposes.

Table of Wave Lengths.

Extreme limit of the infra red spectrum	60,000 $\mu\mu$
Limit of the visible spectrum on the infra red side	810 ,,
Line A Extreme red	712 ,,
Line B Red	688 ,,
Line C Limit of red and orange ...	656 ,,
Line D Yellow	589 ,,
Line E Green	526 ,,
Line F Cyanic blue	484 ,,
Line G Limit between indigo and violet	429 ,,
Line H Violet	393 ,,
Limit of the visible spectrum on the violet side	382 ,,
Extreme limit of the ultra-violet spectrum	100 ,,

It must be well understood that, as we have already stated, there are ether waves with a wave-length longer than 60,000 $\mu\mu$ and shorter than 100 $\mu\mu$. The former do not give rise to calorific phenomena and cannot be set up by the molecular vibratory movement of material bodies; the long ether waves which are made use of in wireless telegraphy are set up by electrical discharges. On the other hand, it is probably to ether waves shorter than the ultra-violet that x-rays are due.

From this brief survey of the subject of ether radiations, it can be seen that the whole gamut of ether waves has been investigated

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Your Anchor in Bad Weather.

IF you have given real service in the past, the present and the future are full of promise for you.

Bad times, like storms, come along occasionally, but you have an anchor on which you can rely if the Service you have rendered has created and developed Customers' goodwill.

Unfailing Service to the country's Sight-testing Opticians has built the L.O.C. We owe our present stability to the personal, prompt, careful attention that all Rx orders invariably receive at our hands.

Service, although a pleasure to render, is to us a business-building policy that we cannot afford to ignore.

Link the L.O.C. Service to your business and both of us will benefit.

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris, France.

Also at—2, Str-Bursei, Bucharest, Roumania.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

APPOINTMENTS BOARD
of the
IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY.

South Kensington,
S.W.7.

EMPLOYERS requiring men who have received a thorough training in Science and Technology and who are Diplomates or Associates of the Imperial College or of one of its three constituent Colleges, are asked to make use of the services of the Board. No fees.

The Imperial College includes The Royal College of Science, The Royal School of Mines, and The City and Guilds (Engineering) College. The Associates of the Colleges receive thorough training in Science and Technology, including Aeronautics, Applied Optics and Optical Engineering, Biology, Chemical Technology, Chemistry (all branches), Engineering (all branches), including Metallurgy, Mining, Mining Geology, and Oil Technology, Geology, Mathematics, and Mechanics and Physics.

THE REPAIRING OPTICIAN
By JOSEPH FRAY, *Practical Optician.*
F'cap. 8vo (6¾ + 4¼). Cloth.
110 Figures. pp. vi + 183. 8/6 net. Post Free 8/10.
¶ This book is intended to help beginners, apprentices and amateurs to overcome many of the smaller problems for the solution of which they might look to larger text-books in vain. The subjects dealt with include tools; the making and tempering of small tools; frames; repairs; rimless lens mounting, and lenses.
HENRY FROWDE, HODDER & STOUGHTON,
The Lancet Building, 1 & 2, Bedford St., London, W.C.2

RADIUM COMPOUND
SELF-LUMINOUS.
Highest Possible Efficiency, Durability and Value.
As supplied to H.M. Government, &c.
Guaranteed to pass N.P.L. requirements.
All Grades in stock, from 15/- per gram.
RADIUM SALTS TESTED AND CERTIFIED.
F. HARRISON GLEW THE RADIUM LABORATORY,
156, Clapham Road, London, S.W.9

A Thermometer of Character

Reproduction of an Antique design, Plain red spirit tube, lacquered brass scale on period finish Oak mount.

SHORT & MASON LTD.,
Scientific Instrument Makers,
Aneroid Works, WALTHAMSTOW, LONDON, E.17

Write for particulars and general booklet.

No. 3710 (half size).

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

except for a gap extending from a wave-length of 3 or 4 millimeters, the shortest Hertzian wave that has been produced and measured by Lampa, to a wave-length of 60,000 $\mu\mu$ or 60 μ or 0.06 mms., the longest infra red wave observed and measured by Langley and Shurman. Neither electrical discharges nor the molecular vibratory movements of material bodies are capable of setting up ether waves of a wave-length included within the limits stated just now and the nature of the radiations corresponding to these wave-lengths is unknown in the present state of physical science.

Efficiency—British and German, in the Scientific Instrument Making Industries.

Referring to a criticism of British *versus* German scientific instrument making which had appeared in the 'Morning Post,' a reply from the manager of an important London firm was printed in last Saturday's issue of that journal. We reproduce below the full text of this most interesting letter from the 'Morning Post':—

"In an article in your issue of Friday, September 23rd, there appeared a number of statements contrary to the truth. It is impossible to escape the impression in reading this article that it is an ingeniously engineered piece of propaganda for the German scientific instrument industry, though how your Special Correspondent can have been so easily caught is a mystery. Most of the first column of the article referred to contains no positive statements, and consists of nothing but an advertisement for the famous firms of Ernst Leitz and Carl Zeiss, and general uninformed praise of German scientific methods. Later on statements definite enough to refute occur, for instance:

> 1. From a purely theoretical interest in organic chemical compounds he (the German scientist) found that aniline dyes might be generated from coal tar.

The first aniline dye was made by Dr. W. H. Perkin (afterwards Sir W. H. Perkin), in 1858; and it was this discovery on which the aniline dye industry was founded.

2. Next we have a reference to the micro-balance, where it is said that

> the balance-making firms have already put the perfected model on the market. . . . long before the new methods had been begun to be discussed in England.

The first micro-balance was made by Dr. Gray in Sir William Ramsay's Laboratory in University College; the essential knife edges for the same were supplied by the firm of which I am manager. Subsequent improvements were made by Dr. Hans Pettersson, a Swedish scientist, also working in Sir William Ramsay's Laboratory.

3. After a brief laudation of the German glass industry, vague, but generally conveying the idea that no glass work is either made or makeable outside Germany,, we come to the statement:

> How to correct for this contracting is the secret of the German maker.

There is no secret in the matter. In chemical durability, the vessels made by English makers of repute are as good as, and in some respects better than, those by German makers of repute, while in the volume constancy of graduated glass apparatus the English vessels are as good as any hitherto received from Germany. Bad glass apparatus is made both in Germany and England, and no one should buy glass vessels not bearing a name.

4. Again:

> Certain apparatus requires glass perfectly plane on both sides and perfectly free from any trace of flaws.

The flattest and most parallel glass in the world is polished by my firm here in London. Certain kinds of apparatus requiring these very flat and parallel pieces of glass have so far as I am aware, never been successfully made outside our works, and they are used, in common with other British scientific apparatus, not only in Germany, but in every other country where researches requiring this kind of apparatus are undertaken.

> 5. Glass spectrum gratings must be ruled with fine parallel lines 28,000 to 30,000 to the inch; the German machines for carrying out this incredibly accurate work are the only ones in the world.

The only machines in the world which have any reputation either in Germany or elsewhere for this kind of work were made in, and have

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

never left, America, one being at the John Hopkins University at Baltimore (the famous Rowland engine), and one designed by Prof. Michelson at Chicago. A large part of these rulings which come to Europe pass through the hands of my firm, and we have within the last two years sent a number of them to Germany. We have never heard of any German machine undertaking this work, and we can say with confidence that no researches of importance have ever been published with work of the kind done in Germany. The great German investigators in this line all use Rowland gratings.

Optical Instruments.

6. In the optical trade microscopes, telescopes, spectroscopes, and spectacle glasses, Germany has a world monopoly.

The world-renowned German physicist, Prof. W. Voigt, speaking publicly in 1912, made the following statement:

> Eine optische Firma von einer Leistungsfähigkeit wie die von —— in London gibt es gegenwartig in Deutschland nicht. . . .
> (An optical firm of such efficiency as —— in London, is not to be found at present in Germany).

The name which I have deleted above is that of my firm. In connection with the manufacture of optical instruments for research, a search has been made through the premier journals of the world devoted to physical science for the years 1910 to 1914. In each of them, in the "Proceedings and Transactions of the Royal Society, and in the 'Philosophical Magazine' (Great Britain); in the 'Physical Review' and the 'Astrophysical Journal' (United States); in the 'Comptes Rendus' (France); and in the 'Annalen der Physik' (Germany); there were without exception more references to instruments made by my firm here in London than to those of any other makers whatsoever. In the case of the 'Annalen der Physik' there were 50 per cent. more references to my firm than to any other, the firm mentioned next in order of frequency being a well-known German one.

Without wishing to say anything against the justly famous glass works of Schott and Co., I feel compelled to point out that the greater part of all glass used by my firm even before the war was of English manufacture, and most of that apparatus in which we were without serious rivals was made from English glass, although we, of course, kept in touch with all the main sources of supply, and still propose to do so. I confine my remarks to the manufactures of my own firm, since I do not pretend to any knowledge of the manufactures of other firms, even in the optical trade. But as you will see from the catalogue which we send under separate cover, those manufactures cover a very wide range of optical instruments for research. Particularly with regard to the researches of the last twenty years, which have been conducted in the physical laboratories of the world, on the constitution of matter as revealed by radiation, our apparatus has the reputation in every country of being unsurpassed from the point of view of quality; and for this reason no important University or physical research institute in the world is without apparatus made by us. The German Universities of Berlin, Jena (that centre of German fine optical industry), Munich, Hanover, Tübingen, and a number of others all have apparatus made by this firm.

Scientific Instruments Generally.

7. In conclusion, at the head of the article appear the words:

> The scientific instruments industry, a German monopoly which is to-day still unaffected by outside competition either in German or other markets.

There are supposed to be 9,000 scientific instrument makers in the industry in the British Islands, usually fully employed—a sufficient refutation of this statement. Not only is it untrue that the so-called German "monopoly" is unaffected by outside competition, but speaking now, as I do throughout this letter, of the products of my firm, we have successfully competed with and beaten Germany in every civilised country in the world on quality, and have replaced German instruments in the laboratories of America and even of Germany. In one case which I can remember we replaced in the laboratory of a German scientific man a piece of German apparatus by a piece of our own apparatus identical in kind, but of much superior quality, although our price was four times that of the German apparatus. I am prepared to substantiate the foregoing statements in any way you like, and I ask you, therefore, with every confidence, to give a full and complete withdrawal of the astounding mis-statements appearing in your Correspondent's article.

I have suppressed the name both of myself and of my firm, as I do not desire to make this occasion an opportunity of advertisement, but the name of myself and of my firm appears at the head of this paper."

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Seven Styles

now made in

"OCENTRIC" EYEGLASSES

BRITISH MADE.



A Distinctive Model for Each Individual Taste.

RIMLESS MOUNTS & FRAMES. G.F. & SOLID GOLD.

0 series Short Plaquets Regular pattern

100 „ Normal Plaquets Regular Pattern

200 „ Long Plaquets Regular Pattern

300 „ For Centrally Drilled Lenses
(BENT UP PLAQUET ENDS.)

400 „ For Centrally Drilled Lenses
(CLAMPS ATTACHED BY SHORT BRACKET.)

700 „ For Centrally Drilled Lenses
(SWAN NECK BRACKETS.)

800 „ Regular Pattern with Double Straps

SAMPLES and PRICES WILLINGLY ON APPLICATION.

The British Ocentric Optical Co., Ltd.,

Wholesale and Manufacturing Opticians,

12 & 13, EAGLE STREET, SOUTHAMPTON ROW,

LONDON, W.C. 1

Telegrams—Ocentricco, Westcent, London. *'Phone—Holborn 560*

Cables—Ocentricco, London.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

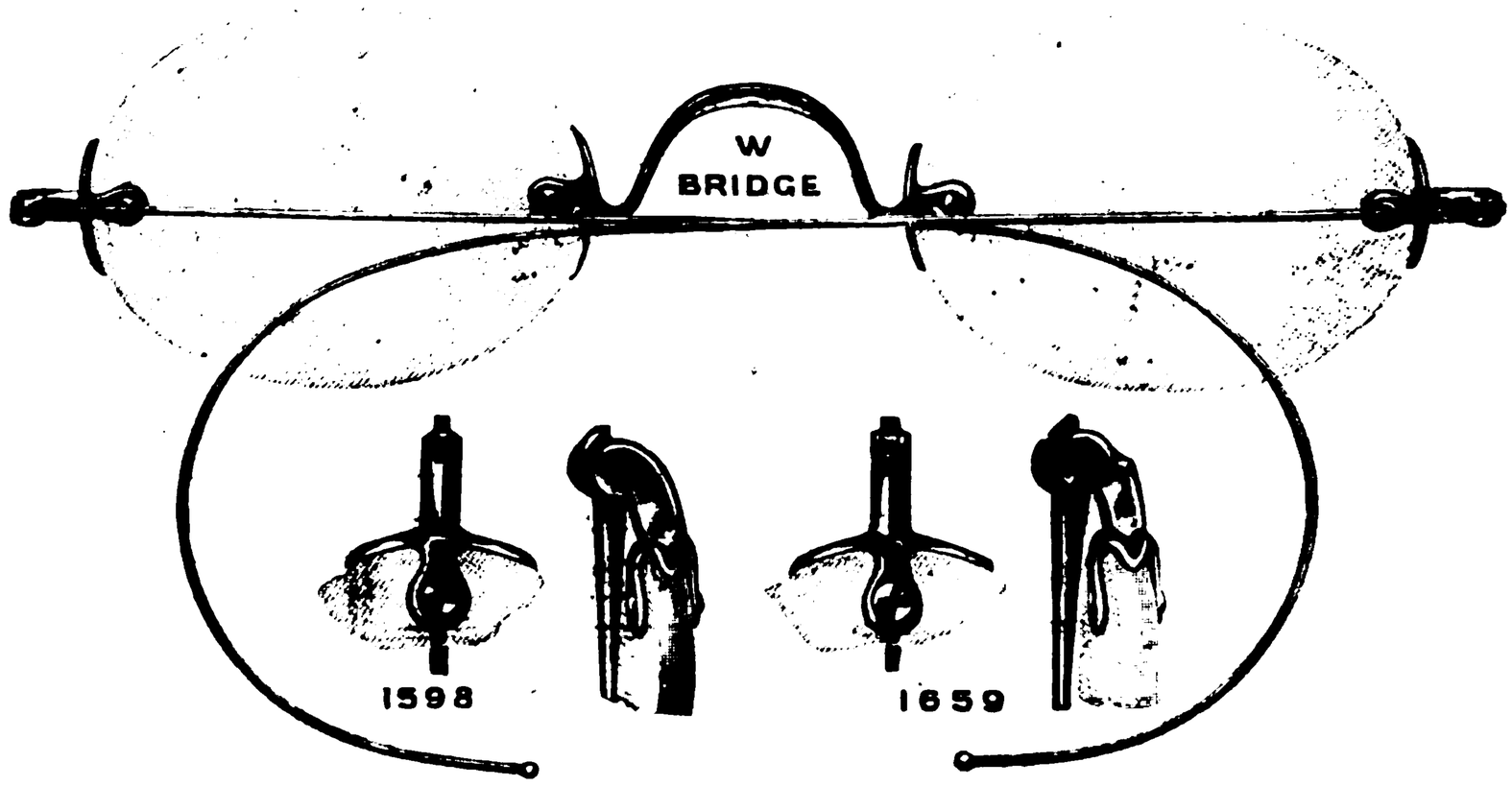
QUALITY FIRST

DUPAUL, YOUNG OPTICAL CO.,

ESTABLISHED 1888.

SOUTHBRIDGE, MASS., U.S.A.

Manufacture only Guaranteed Quality and Best Finish Gold-Filled and White Metal Spectacles, Eyeglass Frames, Astigs, Mountings and Materials.



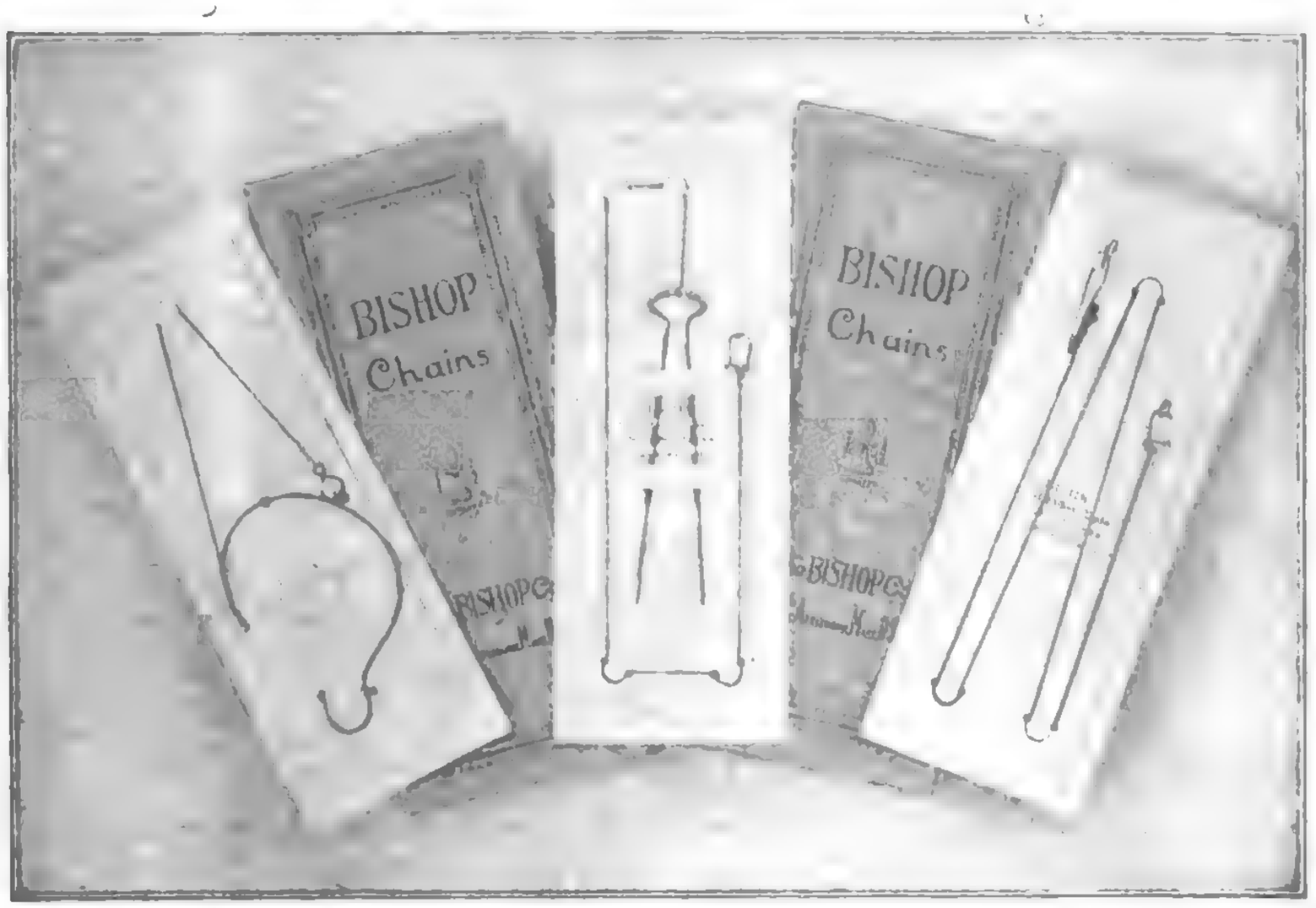
To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY





14-L

BISHOP CHAINS

should be your standard of Quality,
in solid Gold and Gold Filled,

BISHOP SILK EYEGLASS CORDS AND MONOCLE RIBBONS.

With Gold Filled, Silver or Gun Metal snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.



16-L

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

WILLIAM GOWLLAND (1916) Ltd.

MORLAND ROAD, CROYDON.

LONDON. PARIS.

WHOLESALE ONLY.

Telephone—463 Croydon
2 lines 464
Awarded 2 Gold Medals, Brussels, 1910.

Telegrams—Fundus, Croydon.
Cables—Gowlland, London.
Grand Prix and Gold Medal, Turin, 1911.

Ophthalmic Lenses, Optical, and Surgical Instrument Manufacturers.

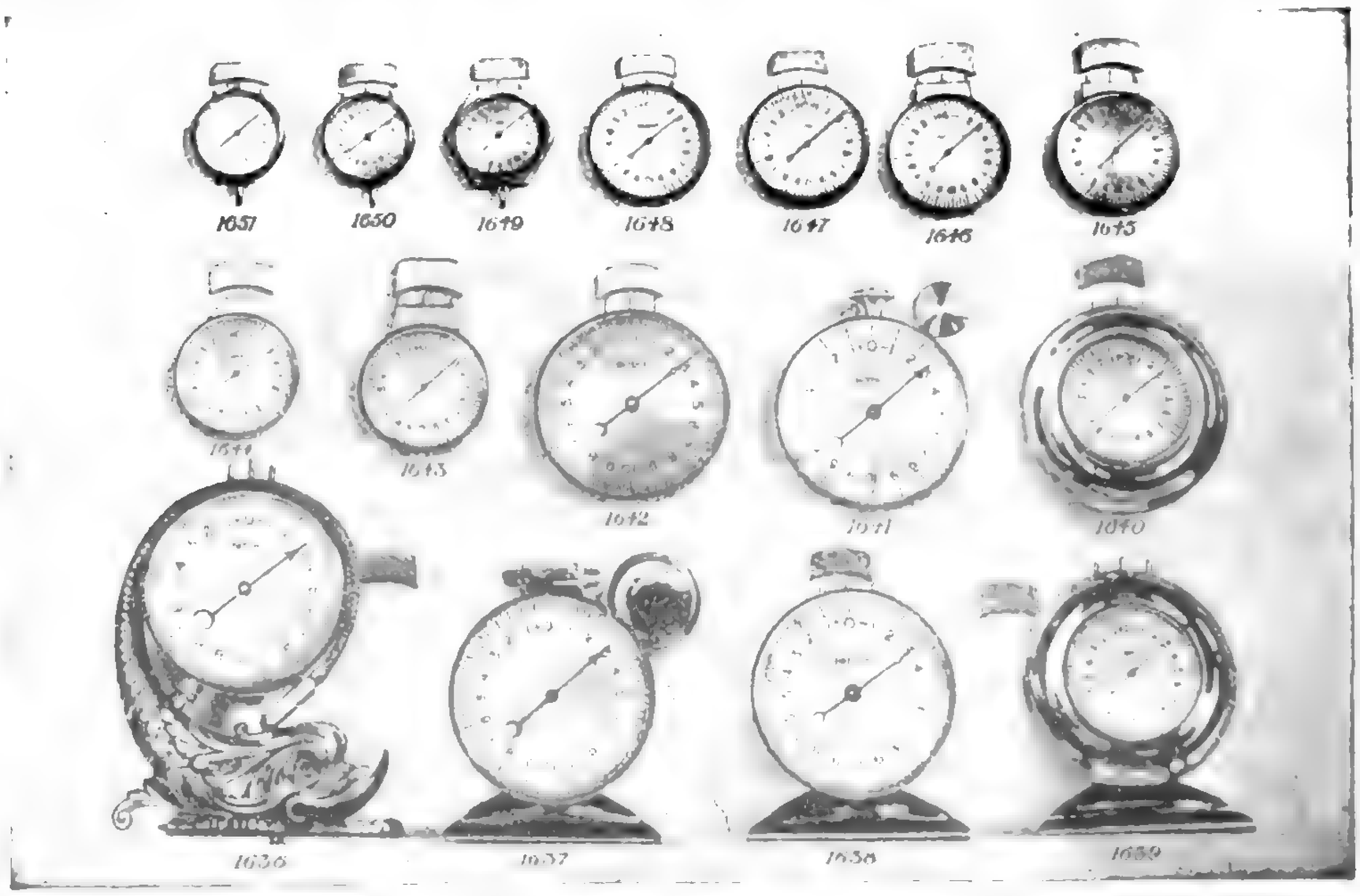
LENS MEASURES.

These Lens Measures are made in our own Factories, and by British Labour.

We hold stocks of "Baby," "Corrugated," "Ordinary" and "Model de Luxe" with readings of 10.D and 20.D also Bi-Focal Measures.

Other patterns made to order.

We have the finest machinery possible for the manufacture of our Uncut Lenses and we hold large stocks of all sights in Sph. Cyls.



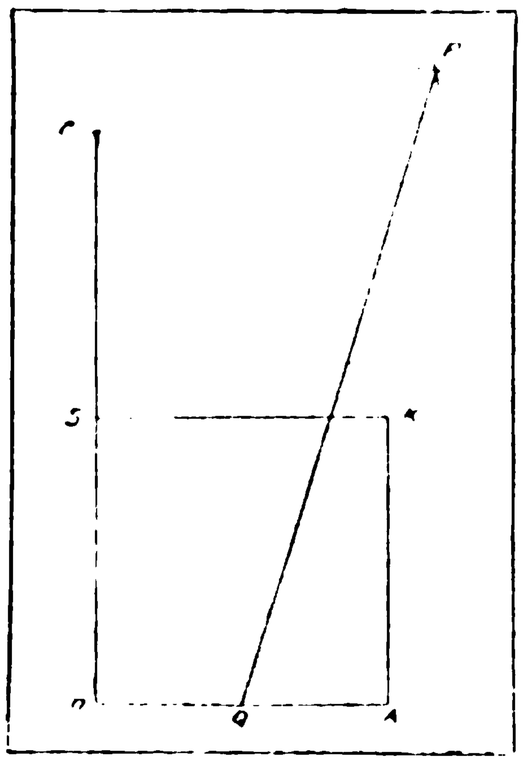
Ask your Wholesale House for Samples.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Duplicating The Cube—Almost.

Every little while, says the 'Scientific American Monthly,' we are called upon to pass on the work of somebody who thinks he has resolved the problem of squaring the circle, of duplicating the cube, or of trisecting the angle. These claims fall into two distinct groups. There is the man who has a construction that will really do what he thinks it will, but which is not itself a Euclidean construction. Nobody, we suppose, would claim to have squared the circle by rolling it through a complete revolution and measuring the line thus generated; yet cubes are duplicated and especially angles are trisected by "stunts" that are equally wide of the recognised rules of the game, and the perpetrators of these stunts demand recognition as having put to shame the integrated mathematical ability of twenty centuries.

Then there is the man who has a construction that he can really carry out with compass



and ungraduated straight edge, and which comes so close to a numerically exact trisection or duplication or evaluation of *pi* that he mistakes approximation for achievement and claims to have solved the age-old riddle. Some of these demonstrations are marvels of draftsmanship, being the fruit of a figure so complicated that it is only with the greatest difficulty that one can follow the various steps and keep a clear idea of what has been proved and what remains to be established. Sometimes, on the other hand, a remarkably close approximation flows out of an extremely simple construction; and a case of this sort possesses a certain degree of inherent interest. Mr. James Smith of Brooklyn has recently put before us an approximate construction for duplicating the cube which stands at the head of this class, and which we reproduce herewith.

Let OC be the side of the given cube. Bisect OC at S, and complete the square OSKA. With radius KC and centres K and C, strike arcs meeting at P. Bisect OA at Q. Then the line PQ represents, to all intents and purposes, the side of the cube whose volume is double that of the cube on OC.

For the purpose of subjecting the construction to analysis, we take O as origin, OA as x-axis, and OC as y-axis. Let $OC = 2s$; then $OS = OA = s$. The point K has co-ordinates (s, s) and the point C has $(0, 2s)$. The distance $KC = s\sqrt{2}$. For the circles about K and C called for in the construction we have the equations

$$(x - s)^2 + (y - s)^2 = 2s^2,$$
$$x^2 + (y - 2s)^2 = 2s^2$$

On simplifying, solving simultaneously, and selecting that intersection which has x positive, we find for the co-ordinates of P the values $\frac{s}{2}(1 + \sqrt{3}), \frac{s}{2}(3 + \sqrt{3})$. Using the distance formula between P and Q, we get for the length PQ the value $\frac{s}{2}\sqrt{15 + 6\sqrt{3}} = t$. For the ratio of the volumes of the cubes on $2s$ and on t we have

$$\frac{t^3}{(2s^3)} = \frac{\frac{s^3}{8}(15 + 6\sqrt{3})^{3/2}}{8s^3} = \frac{(15 + 6\sqrt{3})^{3/2}}{64}$$

In evaluating the numerator, if we take for $\sqrt{3}$ the value 1.732051, which is a trifle too large, we get for the expression $15 + 6\sqrt{3}$ the value 25.392306. For the square root of the value 5.0391 is again a shade too great; for the cube of the last-named quantity the value 127.9555 is for a third time a wee bit over the mark. An upper limit for the ratio between the two cubes is then 1:9993.

If for $\sqrt{3}$ we take the value 1.73205 we get $15 + 6\sqrt{3} = 25.3923$. For the square root of this 5.039 is too small; for the cube of the last 127.94787 is again too small. From this a lower limit for the ratio between the cubes is found to be 1.99918. That a construction of such extreme geometric simplicity should give a non-Euclidean numerical quantity with an accuracy exceeding one-twentieth of one per cent. seems quite remarkable.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics as personal matters or "trade" politics, etc. should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

Eye Affections in Colombo.

Sir,—Absence from England has prevented me from replying earlier to Mr. Leather's letter in your issue of the 2nd ulto., with reference to pterygium and diabetes. There is no connection between these two diseases, except that diabetic subjects show less resistance to infection.

Diabetes, of which there are two forms (diabetes insipidus and diabetes mellitus), is a disease due to a disturbance of metabolism. Pterygium is simply a hypertrophy of the conjunctiva—*i.e.* a degenerative process, the result of external irritation. Medical treatment for this would be useless. Local applications sometimes benefit and arrest the progress of the growth, but surgical aid is the only remedy.

I think, however, that many of the cases seen by Mr. Leather may have been in the nature of pseudo-pterygium, symblepheron, the sequelæ of trachoma or specific conjunctivitis and iritis, these diseases being rife among the coloured races. It is exceptional to find a normal conjunctiva amongst the poorer natives.

Anatomical changes in trachoma, pannus and pseudo-pterygium consist in papillary hypertrophy closely resembling true pterygium, but histological examination of a section shows a difference in structure.

True pterygia are only found near the inner and outer canthi; epiphora is not a constant symptom and vision is not affected unless the pupillary area is encroached upon by the growths. Diabetes on the other hand frequently causes indexial myopia due to changes in the media; bilateral cataracts frequently develop and mature quickly when the amount of sugar contained in the urine is high.

Toxic amblyopia, retinitis and optic neuritis often have their origin in Bright's disease and diabetes, and would probably yield to medical treatment, but pterygium never.

H. F. Sparling.

Croydon.

Dioptric Powers.

Sir, May I trespass in order to reply to your note following my letter in the September 30th number (p. 87).

The lenses under consideration are distinctly qualified, "If considered as worn 15 mm. from the eye." In order that the vertex corrected lens may not be misunderstood, it is of *first importance* to lay stress on the fact that it is equivalent to the original trial lens, and *only* corrects the same ametropia when placed in the same plane as that trial lens.

My suggestion is that the line, "If considered 15 millimeters from the eye," should be replaced by "when placed at the trial lens plane."

It is useless to correct the vertex power without considering planes of position, the vertex problem is solely one of planes of position.

G. J. Hunt.

378, Mare Street, E.8.

Sir, As manufacturers of vertex power, toric and meniscus lenses, we have read your note to Mr. Hunt's letter on your notice *re* new toric lenses, with considerable interest.

We would venture to suggest

(*a*) That for ophthalmic purposes, any lens is equivalent to another (trial lens) when both have the same vertex power and are placed with their vertices in the same plane;

(*b*) That this does not *condition* 15 mm. from the cornea (or any other distance) unless the trial lens has in the first instance been so placed.

Consequently the really important condition is to place the spectacle lens with its vertex to coincide with the position occupied by the vertex of the lens used while testing.

Stigmat, Ltd.

67, Myddelton Street, Clerkenwell.

Optical Trade F.C.

The Bondwell F.C. (C. W. Dixey & Son) received the Great Northern Railway A.A. F.C. at Lea Bridge Road, on Saturday, October 1st, and achieved their initial success of the season in defeating them by 5—0. A very keen game was witnessed by enthusiastic supporters, and the game was characterised by good sportsmanship being shown on both sides. Next Saturday, October 8th, the "Bees" are away at East Finchley to oppose Highbury Institute F.C.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

OPTICAL MANUFACTURERS LTD.,

(Incorporating Wheway Optical Co., Ltd.)

WAR TIME CONTRACTORS TO THE ARMY SPECTACLE DEPOT.

THINK OF THE MONEY YOU LOSE every year (and the dissatisfaction given) because your customers bring back Rimless Specs or Eyeglasses complaining that Lenses have worked loose.

This Trouble and Expense can be entirely avoided by using

The New Patent Tied Straps.

Any wholesaler will supply you with Finger Piece or Rimless Spect. Mtgs. fitted with above.

Works at VYSE STREET and GEM BUILDINGS, HOCKLEY HILL, BIRMINGHAM.

London Office: 55, HATTON GARDEN, E.C.1.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Hospital Rx Work

A REVOLUTION IN PRESCRIPTION PRICES

We have just Organised a New Department to cope with Large Quantities of

HOSPITAL AND EDUCATIONAL CONTRACT WORK

PROMPTLY AND ACCURATELY

AT EXCEPTIONALLY LOW PRICES

SEND FOR PRICE LIST.

Telephone: HOLBORN 1620 (Private Exchange).

KIRK BROTHERS

WHOLESALE & MANUFACTURING OPTICIANS

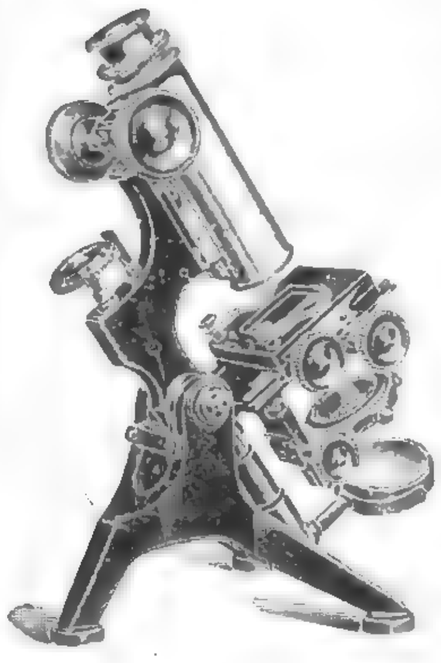
Telegrams: KIRBROREX, HOLB. LONDON.

36, GRAY'S INN ROAD, LONDON, W.C.1

SELL WATSONS' BRITISH-MADE

MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,

313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1837

THE GLASSIE LENS CLEANER

Your Name and Speciality printed here. The "Glassie" becomes your invaluable business bringer.

Your Silent Salesman!

It is conveniently carried in the spectacle case, therefore is always in front of the people in whom you are most interested.

A constant reminder of you.

Can be obtained from your lobber or direct from

THE GLASSIE LENS CLEANER Co

156 CHARING CROSS ROAD, LONDON, W.C.2.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

A Discourse on Monocular Diplopia.

The patient's complaint of double vision should lead promptly to the testing of whether it is binocular or monocular, by covering each eye in succession to see if this leaves diplopia with a single eye in use. This (writes Dr. Edward Jackson) begins the diagnosis; but it is only complete when the exact cause of the doubling has been determined for each particular case, and the significance of what the diplopia implies has been worked out.

This condition has been rather inadequately explained in the text books; and the lists they give of possible causes are often confusing. It is possible for the symptoms to arise from conditions of the refracting media and surfaces; from peculiar displacements of the retina; or, perhaps, as a symptom of disease of the central nervous system. Such conditions as opacities of the cornea or lens or polycoria are associated with monocular diplopia; but the cause of it is the accompanying disturbance of regular refraction, not the opacity or multiplicity of pupils in itself.

A simple form of monocular diplopia is produced in the Scheiner experiment. A card held before the eye, with two pin holes in front of the pupil, will make a distant light look double, if its rays are not perfectly focused on the retina. This anyone can try by imitating in his eye hyperopia or myopia by the use of a concave or convex lens before it. Only when the light is perfectly focused on the retina do the two images fuse into one. Another very simple form of monocular diplopia is produced by placing the edge of a prism before the pupil so that some of the light reaching the retina comes along side of the prism, while some is deflected by coming through it. The same thing is done by looking thorugh the edge of a correcting glass, where a prismatic effect is produced.

The monocular diplopia, produced by imperfections of the dioptric surfaces or media of the eye or by polycoria, is like that of the above experiments. An irregular cornea has portions which are so inclined as to deflect the rays passing through them, as does the prism held partly in front of the pupil. The opacities, that accompany such irregularities, tend to render the separate images more distinct. The same is true of irregularities in the crystalline lens, whether these are irregularities of surface or of refractive index, and the opacities that appear with them. In Polycoria, the different openings in the iris correspond to the different pin holes of the Scheiner experiment, producing diplopia when the light entering the eye is not perfectly focused on the retina. And in polycoria, one or more of the pupils is generally situated so far towards the periphery of the iris that the focusing of the light, entering through it, is certain to be imperfect.

It is not generally realised how marked a monocular diplopia may arise from imperfect focusing (diffusion phenomena) through a normal pupil of not unusual size. Looking at a white line on a black ground with a strong spherical lens or cylinder with its axis parallel to the line, will serve to bring out this kind of diplopia; which appears as a duplication of outline, rather than the perception of separated distinct images. This kind of diplopia is complained of by patients suffering from uncorrected ametropia of high degree, and is more noticed when the regular error is supplemented by irregular astigmatism.

The diplopia, that may arise in detachment of the retina, may be binocular, due to displacement of one retina so that it receives on an abnormal portion an image, the counterpart of which is normally received on the retina of the other eye. It may, however, be monocular, the light impressing both layers of a folded retina, one layer lying behind the other; or fall upon two folds that are in close juxtaposition. In either case the double images are so faint or indefinite that they are not much noticed unless the sight is very defective in both eyes.

About the double vision noticed in connection with cerebral disease, our knowledge is not very definite. In most cases, the occurrence of such images has not been shown to have any definite relation to the anatomy and physiology of the visual centres. In this the double vision closely resembles the paresthesias of hysteria, and probably in most cases the diplopia is hysteric in character. It is well-known that in connection with organic brain disease, hysteric symptoms are apt to arise. But these cases should be studied in minute detail to ascertain if there is any basis other than that of suggestion to account for them.

All cases of monocular diplopia are worthy of close study, and they may help to throw important light on the origin and prognosis of the conditions on which the diplopia depends, or with which it is associated. In a large

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

proportion of instances, there are more than two images present, polyopia; but the fewer the images the more readily they can be studied. A first step towards finding the full significance of the diplopia is to ascertain in which part of the pupil each particular image takes its origin. In a case of partial cataract, this one fact may indicate swelling or shrinking of the crystalline lens, and thus add definiteness and certainty to the prognosis.

The connection with a particular part of the pupil is established by covering that part with a corner of a card, and having the patient notice that the image in question disappears. Changes in the images, and therefore in the conditions of the cornea or crystalline lens that cause them, may often be discovered by placing the patient in a certain definite, easily reproduced position with regard to a point of light; and having him make a drawing of the images he sees. The change in such images, produced by viewing them through different convex and concave lenses, will sometimes help to determine their significance. Studies of such multiple images, made with care and accuracy, will generally be found interesting, and often afford important practical help.

Eye-Strain and how Motorists may Avoid It.

By A SURGEON.

Many of the pleasures of life, of which motoring is not the least, cause great suffering to the eyes. Exposure to the cold, defective or excessive light chemical injury (such as may be set up by following behind a car with a rich exhaust, to which attention was drawn in 'The Motor' recently)—all these very adversely influence the eyes. As motorists especially are exposed to eye-strain and commonly complain of headaches and pain across the back of the eyes, some advice as to the care of the eyes may not be amiss.

Natural light which comes from the sun is as necessary to the eye as is food to the digestive organs; but, just as one's stomach may be so enfeebled by long abstinence that it can only tolerate food in small quantities, so the eyes, by prolonged exclusion of daylight, may be brought into a state where a very moderate amount of light serves to irritate them and a strong light is unendurable.

Many motorists wear dark glasses or "goggles," and when these glasses are removed is should be remembered that the return to daylight (at first merely painful) may be productive—unless cautiously and gradually managed—of permanent eye injury.

To those motorists who are fond of night motoring, and who are tempted by the beauty of the moon to gaze earnestly in her face, it should be said that continued gazing at the moon produces marked weakness and distress to sensitive eyes, as, of course, will the glare of powerful headlights which one may come across during a night ride. Reading in a car which is moving—a great pleasure to some of us—is, from a physiological point of view, highly undesirable. Not only are the eyes dazzled by inequalities of light and from light falling in upon the page from one or other side but also, where there is any oscillation of the car, a constant slight variation of the distance of the page from the face is occasioned, and there is necessarily a corresponding variation in the distance for which the eyes must be accommodated.

The purity and temperature of the air surrounding the eyes is of great importance, says the contributor to 'The Motor,' whom we quote. When motoring, this air may be charged with dust, acrid exhaust vapours, particles of tar from the roads, and all these produce irritation or inflammation either directly or when the eyes are tired and heated.

Although the eyes are better protected than

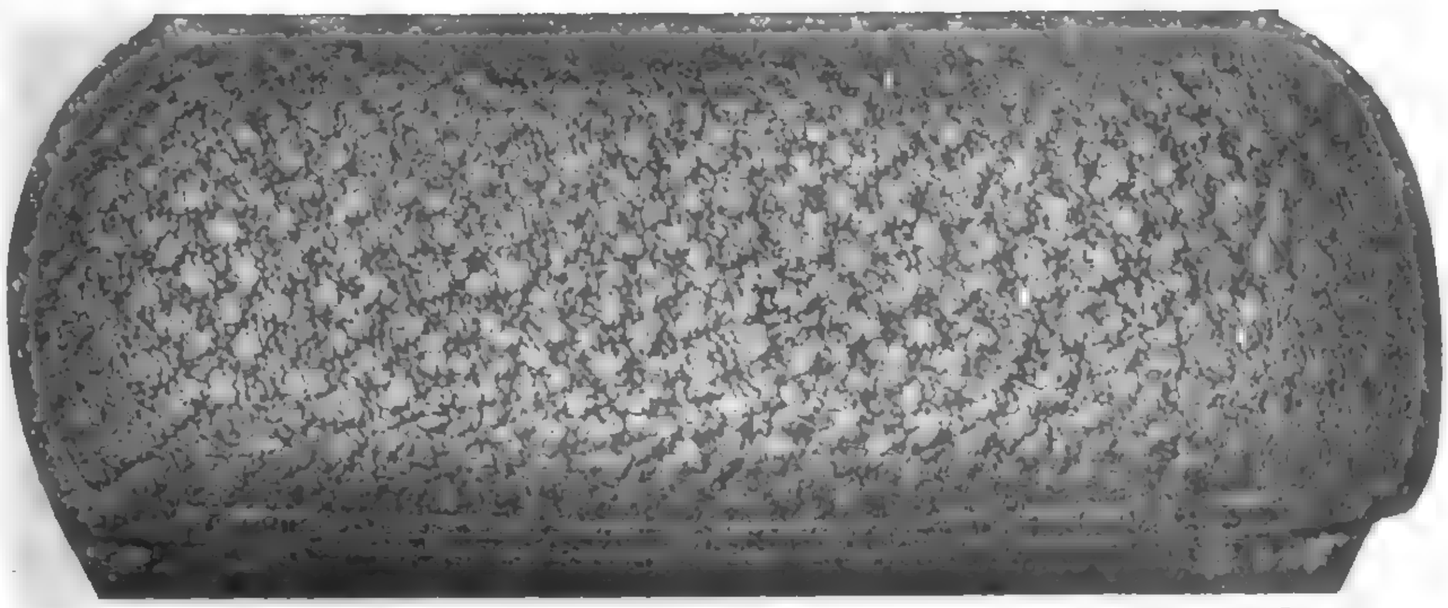
NOTICE.

This is to remind you that we shall be issuing our AUTUMN SPECIAL NUMBER, as usual, (Oct. 28), and we should be pleased if you would send your copy as soon as convenient.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"WERTEX"
WILLMOTTS'
LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.



12E 12E

Let the Cases you handle be more than mere containers, let them reflect the quality of their contents and be a lasting reminder of the services you render.

Use "WERTEX" Cases.

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

ENGLAND.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY



CHEMICO CLEERVIEW.

Is the invention of a Spectacle user, who is also a chemist, who realized that sight might be considerably improved by the SCIENTIFIC CLEANSING and polishing of the lenses of SPECTACLES, EYEGLASSES, Etc.

Polishing the lenses by the usual method with the pocket handkerchief does not give that clear view and power of which the glasses are capable.

CHEMICO CLEERVIEW is a perfect cleanser and polish and has the peculiar property of preventing fogging and steaming.

THE COUNTY CHEMICAL Co., Ltd., Chemico Works, BIRMINGHAM.

Rx

SANDRO LOWY

Optical Rx Specialist,

88, Goswell Road,

LONDON, E.C. 1

Telephone: CITY 304 (two lines)

Telegrams: SANOPTIC, LONDON.

Rx

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

other parts of the body, yet they frequently sustain strain and injury which they show by setting up those tiresome headaches which all motorists know so well. It is superfluous, therefore, to consider how these things may, to a large extent, be prevented.

Motorists who are exposed to the dust should often wash the eyes with cold water. Clean river water or clean spring water is best for the purpose. When the body is heated, take care that the water is not too cold, but washing with hot water relaxes the eyes and makes them more predisposed to inflammation and, as a rule, should only be practised by the order of a medical man. A saturated solution of boric acid is the recognised eyewash. It may be made by placing a quantity of the powder in a jug and pouring boiling water on it, allowing it to stand to cool, when the water will absorb as much of the boric acid as it can, the remainder falling to the bottom.

Foreign bodies (flies, dust, bits of trees, etc.) are often thrown violently against the eye by the wind. When such an accident occurs, Nature will try to drive away the invader by a copious secretion of tears. On no account rub the closed lids with the fingers, as in this way a foreign body may easily be driven more deeply into the tissue on which it rests, and removal may be far more difficult.

Keep the lid open, either with or without the assistance of your finger, and roll the eye up and down and from side to side, or pull the top lid over the ball of the eye. If this is unsuccessful, wash the eye with cold water, and if still the foreign body cannot be seen or found, then medical advice should be sought.

To sum up:—(1) Do not expose the eyes to sudden differences of light; (2) do not read for any length of time while travelling; (3) protect the eyes from impure air by means of suitable goggles; (4) en route, bathe the eyes with cold water; (5) never rub the eyes with the fingers, and as soon as possible bathe with boric solution.

Attention to these points will help considerably to keep the eyes efficient and in comfort, and beauty.

Marriage of Mr. L. D. Selfe.

The marriage took place on Saturday last at St. John's Church, Dulwich, of Mr. L. D. Selfe to Miss W. Martin, daughter of the late W. T. Martin, Esq., Mayor of Camberwell. Mr. L. D. Selfe is the second son of the well-known ophthalmic optician, Mr. H. M. Selfe, of Dulwich, and served his country during the fateful years 1915-19.

The World's Optical Work

Gleanings from the Technical Press and other Sources.

Device for Spectacles for Infants.

Dr. J. Hiland Dewey has devised (and exhibited to the Colorado Ophthalmological Society) a spectacle frame and basket-like contrivance for holding a pair of spectacles on a four months' old infant. The frame has short temple pieces reaching to the temporal region, with a loop on the end of each for holding a short ribbon. From this ribbon run three other ribbons, which pass round the head to the temple piece on the other side, one ribbon below the occipital protuberance, one slightly above the first, and the third considerably higher. These are joined by several vertical ribbons, which give it somewhat a basket-like appearance. With the growth of the infant the attachment of the ribbon at one of the temperal pieces may be readily lengthened. In this way indentation of the nasal bridge is avoided.

Special Observations in Refraction.

Dr. G. F. Libby gave a short lecture before the Colorado Ophthalmological Society, dealing with some observations of practical interest as regards the treatment of exceptional refractive conditions.

In *amblyopia*, while the poor vision made the selection of a lens difficult for the patient, yet accurate skiascopy, with persistence by the examiner in the details of the subjective test, would often be rewarded by an improvement of from twenty-five to fifty per cent. under the use of the correcting lens.

In *anisometropia*, although it was commonly thought that not over 1.50 or 2D. of anisometropia could be harmonised, Dr. Libby had at times been able to correct a difference of 6D. or more with comfort to the patient. An example was given in which a man aged 36 years, who had been wearing for two years R. −8.00 sph., L−5.00 sph. combined with +1.00 cyl. ax. 90 degrees, found himself able to read with comfort for hours upon wearing R.−11.00 sph. combined with +1.25 cyl. ax. 90 degrees, L. −5.00 sph. combined with +1.25 cyl. ax. 90 degrees; the vision of either eye as thus corrected being 5/6 partly.

Patients who suffered from *nystagmus* often brought objects very close to the eyes in

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

order to obtain accurate vision of small details, and in such cases, even in young patients, it was frequently justifiable to use a bifocal lens. Thus in a man aged 21 years who suffered from horizontal nystagmus, and who required a high plus spherical correction, headache which had persisted during one month on use of the distant glasses for close work had ceased upon employment of stronger spheres for near work; so that a bifocal addition of +2.00D. sphere to the distant lens had been ordered and had proved very acceptable.

In the course of discussion on the above paper, Dr. Melville Black, said he had not been impressed with the improvement obtained in amblyopic eyes where the other eye had normal vision. "I have endeavoured in many young patients, especially squinters, to exclude the good eye and force up the vision in a poor one. I saw to-day a child of seven or eight years who has worn an occlusive bandage for four months continuously, and the vision in the amblyopic eye was and still is 20/200. On the other hand, in cases typified by a patient who accepts 0.50D. cylinder in one eye and 4.75D. cylinder in the other, and where the patients have come to me uncomfortable with such correction, I have frequently put a plano over the worse eye and obtained relief. The discomfort produced in such a case is due to the marked prism action of the very unequal correction; yet this trouble does not occur in other cases of the same class."

Mr. J. J. Pattee said:- "During a prolonged experience of Dr. Worth's very painstaking work in strabismus, I saw a large number of disappointing results after the use of amblyoscope and occlusion of the good eye."

Mr. W. H. Crisp mentioned the case of a boy of 12 years in whom great improvement as regards school work had followed prescription of bifocal glasses; and further suggested that in highly anisometropic patients it was occasionally advisable to try the use of one eye for distant and the other for near vision instead of prescribing bifocals.

Age Changes in the Refraction of Crystalline Lens.

Mr. G. F. Alexander read before the Ophthalmological Society of the United Kingdom, a paper dealing with the influence of age on the power of the crystalline lens. He said the prevailing teaching inferred that in the lens there were surfaces acting as concave refracting surfaces, and that the increase in the index of the cortex was, by increasing their power, the cause of the diminution of the power of the lens as age advanced. The author, however, contended that there are no such surfaces in the lens. In regard to refraction, a spherical surface separating two media of different index was convex if its centre is on the side of the one of greater index, and concave if it is on the side of the one with less index. And as in the lens and its nucleus the more central the lamellæ were the higher were their indices, the centre of their curvature must lie on the side of the medium of greater index. Hence the surface separating the cortex and nucleus is a convex and not a concave one; and a ray incident on either surface of the lens encounters in its transit through it a series of convex refracting surfaces, and at no part of its surface a concave one. He contended, secondly, that the cause of the diminution of the power of the lens as age advances is the diminution in the convexity of its surfaces and those of the nucleus from their growth. He showed that the radius of the surface of the lens is greater than that of the surface of the nucleus. The only factor tending to diminish the power of the lens as age advances is the increase in the radii of its surface and those of the nucleus accompanying their growth.

IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY.

South Kensington, S.W.7.

Department of Optical Engineering and Applied Optics.

Lecture Courses will be given during the Autumn Session, 1921, on

General and Advanced Optics; and Polarised Light, by Professor Cheshire.

Elementary and Advanced Optical Designing and Computing; and Workshop and Testing Room Methods, by Professor Conrady.

Advanced Optics; and Construction Theory and Use of Optical Measuring Instruments, by Mr. L. C. Martin.

Due notice will be given of certain special courses, including one by Professor Fowler, F.R.S., on Spectroscopy.

For further particulars and for admission tickets apply to Registrar at the above address.

The Director is open to receive applications from students and others desirous of carrying out research work in the Laboratories.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Rx

LYONS' SERVICE

Our Aims are
Quality & Promptness
For High Class Rx Work.

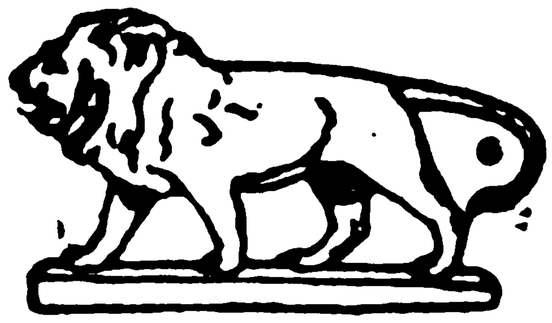
TRY US.

Stock Orders solicited

FULL STOCKS:—Gold and G. F. Cable Frames and Astigs, Rimless Mounts, Shell Goods, Cases, Cords, Chains and UNCUT LENSES.

F. H. C. Lyon,
Wholesale & Manufacturing Optician,
59-61, Hatton Garden, London, E.C.1

Telegraphic Address:
CYLTORREXO, SMITH, LONDON.



Regd. Trade Mark.

Telephone No.:
HOLBORN 1203.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

"You Cannot SQ *Buy Better"*

STEVENS' QUALITY Optical Goods

UNQUALIFIED approval meets this celebrated line wherever introduced.

WE are sole agents for the United Kingdom and can invariably supply your requirements from stock.

One Quality Only—The Best Made

1/10th 12ct. Gold Filled

Specialising in the Fingerpiece Mount

Send us your enquiries for
Spectacles and Eyeglasses—Frames and Mountings

Complete Catalogues on Application

H. WILLIAMSON Ltd.

Optical Section

87/89 GREAT SAFFRON HILL, LONDON, E.C.1

General Optical Supplies—Prescription and Repair Work—
Fittings and Instruments—Optical Machinery

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Shur-on Glasses

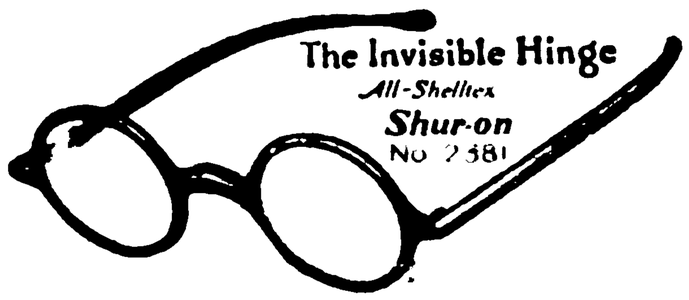
Look for this Trade Mark

Shur-on

High grade, standard products of every kind are naturally subjected to imitation.

To be sure of getting *the* optical products, which, for well upwards of half a century have been universally known and worn because of their "Quality Beyond Question"—look for the trade mark, "Shur-on." It is your protection against inferior imitations.

If your wholesaler cannot supply you, write us mentioning his name.



New!

An All Shelltex frame with rivetless front and almost invisible hinge *anchored* in the heart of both the temple and the frame, where it resists the strain and stress of wear and tear, thus ensuring long-lasting satisfaction. A real masterpiece!

Shur-on Optical Co.,

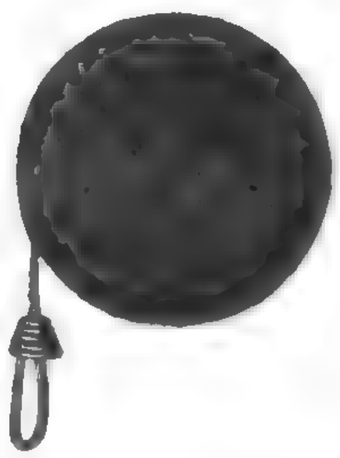
Rochester,

New York, U.S.A.

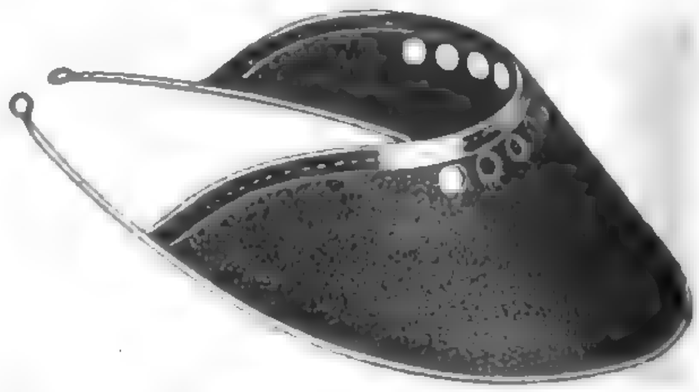
Quality Beyond Question Since 1864

Digitized by Google

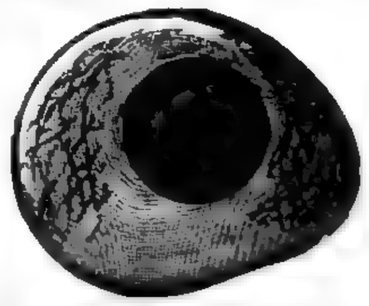
Original from THE OHIO STATE UNIVERSITY





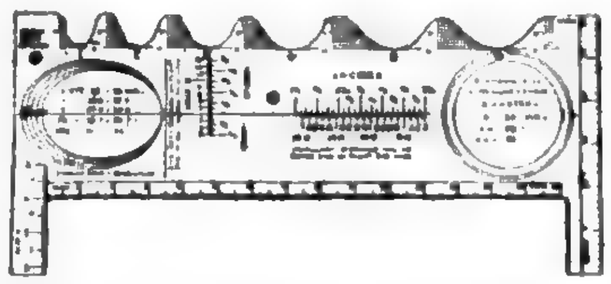


Eye Shades and Reading Shades in Great Variety.

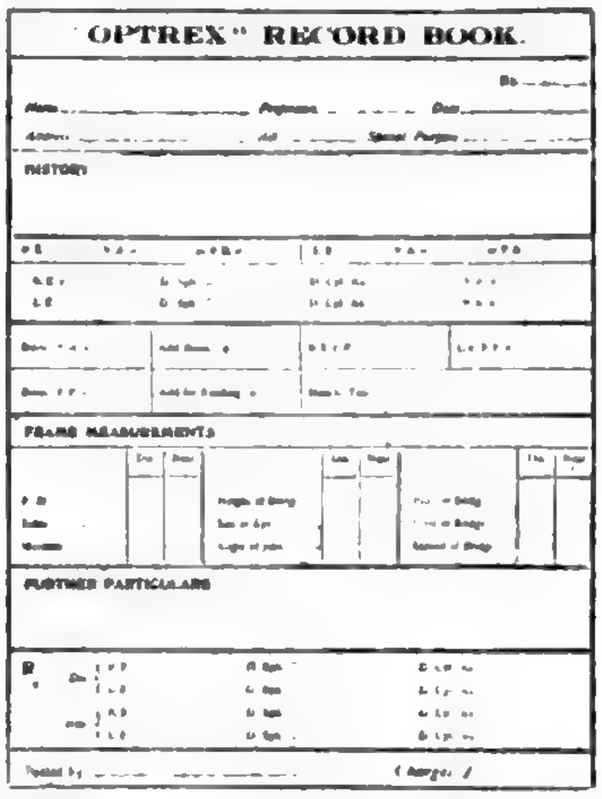


Artificial Eyes, Snellin or Shell at moderate prices. Samples and quotations on application.

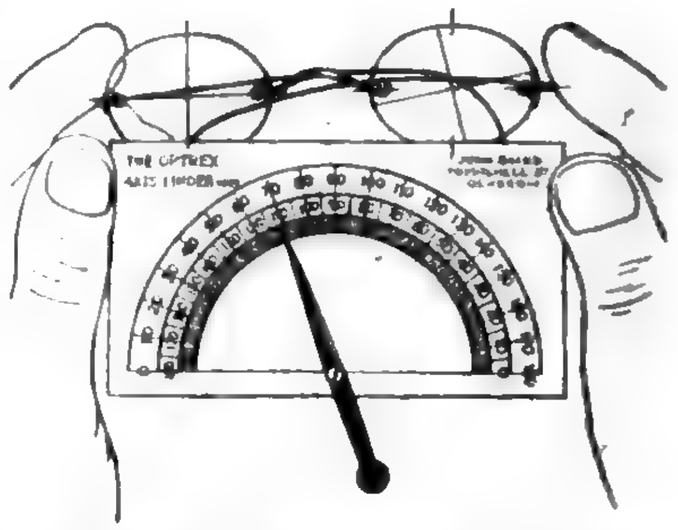
Automatic Eyeglass Chains.



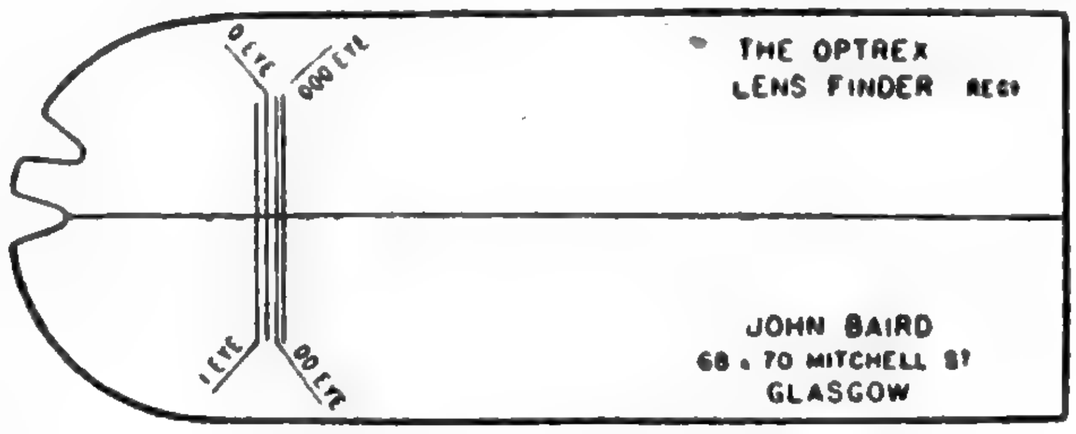
The 'Optex' Rule for Facial and Frame Measurements. The only Rule combining all necessary measurements for either ordering or checking Rx work. Made in Aseptic Ivorine only. Handy size for pocket 7½ x 3½ in. **10/6** in case or **9/6** without. Complete with instructions (illustrated)



The "Optrex" Record Book No. 101 containing 500 Record Forms with full details for each test, quarter bound with index and title page, 7s. each. No. 102 ditto, but contains 250 forms, 5s. each. Postage extra.

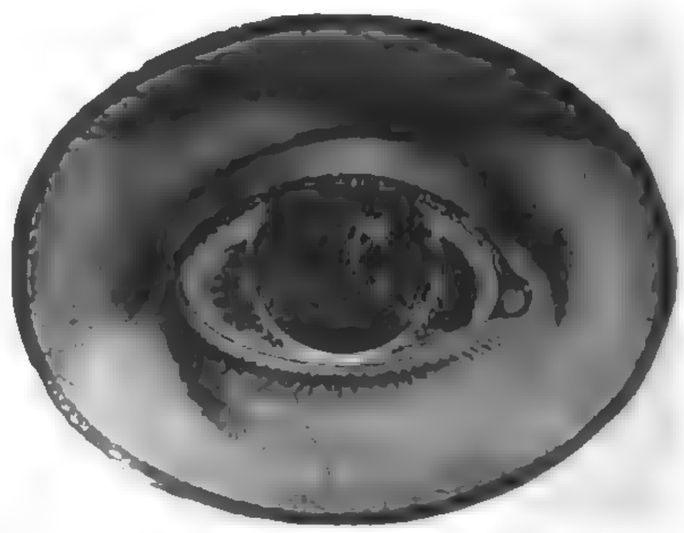


The "Optrex" Axis Locator for quickly finding the axis of plano cyl. or sph. cyl. lenses. Price **5/6** each. **Post Free.**



(Exact size. Made in Transparent Celluloid.)

The "Optrex" Lens Finder for Rimless Eyeglass Mounts. It enables the optician to stock and fit the actual mount which is to be glazed for his client, giving the correct size lens for the P.D. Price **1/3** each. By post **1/5** each.



Translucent Eyes for Windows and Show Cases, in 3 sizes.

6 x 4½ ins.	...	...	**1/9**
12 x 9½ ins.	...	...	**3/-**
18 x 13¾ ins.	...	...	**9/-**

per pair. Postage 3d. extra.





The "Optrex" Case Labels. Round or Oblong, printed complete with any name and address **8/3** per 1,000

R (Standard Notation) L

		SPH.	CYL.	AXIS	SPH.	CYL.	AXIS
DST							
RDG							

The "Optrex" Rubber Rx. Stamp.

3/9 each. By Post 3/11.

Very useful for rough records and post card orders.

JOHN BAIRD,

Manufacturing Optician,

Telegrams: "SPECTACLES, GLASGOW."

"HERALD" OPTICAL WORKS,
68 & 70, MITCHELL ST., GLASGOW.

Telephone: CENTRAL 541.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

INVISIBLE FRIENDS :

Since the inception of the W.O.W. Rx Service two years ago, we have made numerous firm friends. They have never seen us. We have never seen them. Yet we know and understand each other.

. . . .

We do our best for them (the W.O.W. best is a really good best) and they in return help us by their continued orders, and often by recommending our service to fellow Opticians.

. . . .

Many of the W.O.W. supporters have come to us by sheer recommendation, and we are justly proud of it. Experience the Willesden Way yourself. We are keen, young and eager to satisfy.

. . . .

The W.O.W. service is *the* service for satisfaction. Incidentally it saves you money, but we will not press the money gain here, lest you should (as many do) find it difficult to believe that it is possible to pay less and yet obtain the very best of quality and service.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY:
DUDDEN HILL LANE,
WILLESDEN, N W. 10

C. BAKER 244 HIGH HOLBORN LONDON

Microscopes & Accessories
PHOTOMICROGRAPHIC APPARATUS,
APLANATIC MAGNIFIERS, Etc.

WRITE FOR LIST AND TERMS,
Post free on application.

Estab. 1765

DIXON & HEMPENSTALL,
Wholesale and Manufacturing Opticians,
12, SUFFOLK STREET, DUBLIN.

Telegrams "Optics, Dublin."

T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and ABRONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
ESTABLISHED 1876 TELEPHONE CITY 419

OPHTHALMIC AND SCIENTIFIC
MOULDINGS
Supplied in any Curvature and Glass.
CROOKES A SPECIALITY.
REYNOLDS & BAILEY, 15-19, VINE ST.,
LONDON, E.C.1



OPTICAL BLOCKS
To illustrate all features
of Optical Service. Write for lists.
CHEMISTS' DESIGN SERVICE
12 Humberstone Gate, LEICESTER.

PERCY S. DE SAULLES.
Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES
Micro Cover Glasses, Glass Cells and Cavity Slips, etc.
The Platts, Amblecote, Stourbridge.

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
C. S. DYMOND, M.I.Mech.E., F.I.C.P.A
W. P. THOMPSON & CO.,
12, CHURCH STREET, LIVERPOOL.
Chartered Patent Agents.
H. E. POTTS, B.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

SPECTACLES & EYEGLASSES.
Their Forms, Mounting and Proper Adjustment
by R. J. PHILLIPS, M.D.
Fourth edition revised with 56 illustrations.
Price 6s. 6d. Post Free 7s.
THE HATTON PRESS, Ltd., 125, Fleet Street, London, E.C.4

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

LIQUIDATION. Large stock un-cut lenses, frames, mountings, and repair material for disposal. Enquiries solicited. Dutton, Armstrong & Co., Accountants, 4, Piccadilly, Manchester.

FOR SALE. Half-plate stand camera, mahogany, 16" ext. Beck-Steinheil Unofocal Ser. 1., No. 5. *f*/6 with Beck Celverex shutter, T,B to 1/80 sec, 3 mahogany double dark slides, stand, focusing cloth, waterproof case, the whole £3 10s. Also ¼-plate Holborn reflex, magazine 12, Ilex. R.R. *f*/77. T. and I to 1/100 sec. Leather case, £2. Please address, Box 3475, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

PARTNER Required for high-class business in Dublin. Must have a thorough knowledge of sight-testing and visual optics generally. Age not to exceed 25. Box Optician, c/o McConnell's, 10, Great Brunswick Street, Dublin.

WANTED, Partner with experience of sight-testing, suit young man with small capital studying for the S.M.C. examination. Good prospects, business already established some time. Write, Box 3484, c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 8*

GLAZIER, female, shortly disengaged, requires situation, piece-work preferred. D.D., 80, Garthorne Road, Forest Hill, S.E.23.

RECEPTIONIST. Young Lady, 21, experienced shorthand typist and general office routine, 5 years with leading firm of opticians. Box 5685, c/o "The Optician," 125, Fleet Street, E.C.4.

WHOLESALE Rx house require first class rimless fitter, cutter and glazier, expert checker and order clerk for stock room. Apply Box 5691, c/o "The Optician," 125, Fleet Street, E.C.4.

The Optical Society.
President: Mr. R. S. Whipple, M.I.E.E.
Vice-Presidents: Prof. Frederic J. Cheshire, C.B.E., Director of the Technical Optics Department of the Imperial College of Science and Technology, South Kensington; Sir Herbert Jackson, K.B.E., F.R.S.
Hon. Treasurer: Mr. I. G. Aitchison, B.A., LL.D.
Hon. Secs.: Mr. L. C. Martin, B. Sc., Imperial College of Science and Technology, South Kensington S.W.7 and
Papers' Secretary: Mr. F. F. Bryson, M.A., B.Sc.

The Society of Chemist-Opticians.
President: Mr. F. S. Horsey
Vice-Presidents Mr. Fouracre.
Hon. Secretary: Mr. J. Harcourt Cuff, Friern Barnet Rd. New Southgate, N. 11 Telephone Finchley
THE SUPPORT OF ALL CHEMIST-OPTICIANS IS EARNESTLY INVITED.

NO! *We are Not* a Prescription House in the true sense of the word — BUT —
"OPHTHALMIC LENS WORKERS"
You send your BLANKS to us, and we GRIND, SMOOTH, POLISH, etc., to instructions, and return for you to Glaze and fit to Frames.
THUS HELPING YOU TO MAINTAIN YOUR Rx SERVICE.
TWO DELIVERIES DAILY. F. ELEY & Co., 110. King's Cross Rd., W.C.1

Manufacture Mécanique de Lunetterie & d'Optique
LIZON & Cie. at Morez du Jura — France. —
Formed by the amalgamation of the old firms:—HENRI COLIN FILS
ALPHONSE BUSSOD-ORY ANDRE CAMELIN LES FILS LOUIS LIZON
LOUIS ARBEZ GUY BUFFARD EMILE MANDRILLON
EYEGLASSES & SPECTACLES high-class goods in any metals and materials, any supplies for fitting and repairing spect. (straight and cable temples)
Clips, Rimless, Fits-u (Rivets, Screws, Crowns, Springs), D Eyes Spect. Frames with Collapsible and Folding Gauze Cups. Motor Goggles.
Optical Lens Manufacturers—Wholesale Only.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

INVISIBLE FRIENDS :

Since the inception of the W.O.W. Rx Service two years ago, we have made numerous firm friends. They have never seen us. We have never seen them. Yet we know and understand each other.

. . . .

We do our best for them (the W.O.W. best is a really good best) and they in return help us by their continued orders, and often by recommending our service to fellow Opticians.

. . . .

Many of the W.O.W. supporters have come to us by sheer recommendation, and we are justly proud of it. Experience the Willesden Way yourself. We are keen, young and eager to satisfy.

. . . .

The W.O.W. service is *the* service for satisfaction. Incidentally it saves you money, but we will not press the money gain here, lest you should (as many do) find it difficult to believe that it is possible to pay less and yet obtain the very best of quality and service.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY:
DUDDEN HILL LANE,
WILLESDEN, N.W. 10

C. BAKER 244 HIGH HOLBORN LONDON

Microscopes & Accessories
PHOTOMICROGRAPHIC APPARATUS,
APLANATIC MAGNIFIERS, Etc.

WRITE FOR LIST AND TERMS,
Post free on application.

Estab. 1765

T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and ABRONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
ESTABLISHED 1878 TELEPHONE CITY 419



OPTICAL BLOCKS
To illustrate all features of Optical Service. Write for lists.
CHEMISTS' DESIGN SERVICE
12 Humberstone Gate, LEICESTER.

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
C. G. DYMOND, M.I.Mech.E., F.I.C.P.A
W. P. THOMPSON & CO.,
12, CHURCH STREET, LIVERPOOL.
Chartered Patent Agents.
H. E. POTTS, B.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

DIXON & HEMPENSTALL,
Wholesale and Manufacturing Opticians,
12, SUFFOLK STREET, DUBLIN.
Telegrams "Optics, Dublin."

OPHTHALMIC AND SCIENTIFIC
MOULDINGS
Supplied in any Curvature and Glass.
CROOKES A SPECIALITY.
REYNOLDS & BAILEY, 15-19, VINE ST.,
LONDON, E.C.1

PERCY S. DE SAULLES.
Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES
Micro Cover Glasses, Glass Cells and Cavity Slips, etc.
The Platts, Amblecote, Stourbridge.

SPECTACLES & EYEGLASSES.
Their Forms, Mounting and Proper Adjustment
by R. J. PHILLIPS, M.D.
Fourth edition revised with 56 illustrations.
Price 6s. 6d. Post Free 7s.
THE HATTON PRESS, Ltd., 125, Fleet Street, London, E.C.4

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

LIQUIDATION. Large stock un-cut lenses, frames, mountings, and repair material for disposal. Enquiries solicited. Dutton, Armstrong & Co., Accountants, 4, Piccadilly, Manchester.

FOR SALE. Half-plate stand camera, mahogany, 16" ext. Beck-Steinheil Unofocal Ser. I., No. 5. *f*/6 with Beck Celverex shutter, T,B to 1/80 sec, 3 mahogany double dark slides, stand, focusing cloth, waterproof case, the whole £3 10s. Also ¼-plate Holborn reflex, magazine 12, Ilex. R.R. *f*/77. T. and I to 1/100 sec. Leather case, £2. Please address, Box 3475, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

PARTNER Required for high-class business in Dublin. Must have a thorough knowledge of sight testing and visual optics generally. Age not to exceed 25. Box Optician, c/o McConnell's, 10, Great Brunswick Street, Dublin.

WANTED, Partner with experience of sight-testing, suit young man with small capital studying for the S.M.C. examination. Good prospects, business already established some time. Write, Box 3484, c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 8*

GLAZIER, female, shortly disengaged, requires situation, piece-work preferred. D.D., 80, Garthorne Road, Forest Hill, S.E.23.

RECEPTIONIST. Young Lady, 21, experienced shorthand typist and general office routine, 5 years with leading firm of opticians. Box 5085, c/o "The Optician," 125, Fleet Street, E.C.4.

WHOLESALE Rx house require first class rimless fitter, cutter and glazier, expert checker and order clerk for stock room. Apply Box 5091, c/o "The Optician," 125, Fleet Street, E.C.4.

The Optical Society.
President: Mr. R. S. Whipple, M.I.E.E.
Vice-Presidents: Prof. Frederic J. Cheshire, C.B.E., Director of the Technical Optics Department of the Imperial College of Science and Technology, South Kensington; Sir Herbert Jackson, K.B.E., F.R.S.
Hon. Treasurer: Mr. I. G. Aitchison, B.A., LL.D.
Hon. Secs.: Mr. L. C. Martin, B. Sc., Imperial College of Science and Technology, South Kensington S.W.7 and
Papers' Secretary: Mr. F. F. Bryson, M.A., B.Sc.

The Society of Chemist-Opticians.
President: Mr. F. S. Horsey
Vice-Presidents Mr. Fouracre.
Hon. Secretary: Mr. J. Harcombe Cuff, Friern Barnet Rd. New Southgate, N. 11 Telephone Finchley
THE SUPPORT OF ALL CHEMIST-OPTICIANS IS EARNESTLY INVITED.

NO! *We are Not* a Prescription House in the true sense of the word — BUT —
"OPHTHALMIC LENS WORKERS"
You send your BLANKS to us, and we GRIND, SMOOTH, POLISH, etc., to instructions, and return for you to Glaze and fit to Frames.
THUS HELPING YOU TO MAINTAIN YOUR Rx SERVICE.
TWO DELIVERIES DAILY. F. ELEY & Co., 110. King's Cross Rd., W.C.1

Manufacture Mécanique de Lunetterie & d'Optique
LIZON & Cie. at Morez du Jura — France. —
Formed by the amalgamation of the old firms:—HENRI COLIN FILS
ALPHONSE BUSSOD-ORY ANDRE CAMELIN LES FILS LOUIS LIZON
LOUIS ARBEZ GUY BUFFARD EMILE MANDRILLON
EYEGLASSES & SPECTACLES high-class goods in any metals and materials, any supplies for fitting and repairing spect. (straight and cable temples)
Clips, Rimless, Fits-u (Rivets, Screws, Crowns, Springs), D Eyes Spect. Frames with Collapsible and Folding Gauze Cups. Motor Goggles.
Optical Lens Manufacturers—Wholesale Only.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Prefix is alright but what really counts is

THE SUFFIX

Crookes glass dates back to say 1913, and made by anyone is original and genuine, but it is important to remember that applies only to Sir Wm. Crookes A and B Glass. Since that date much water has flowed under London Bridge and Sir William only ceased his labours when he brought out his *Ultimate* Glass—the result of his long years of research. The only genuine Crookes Ultimate is made by—

SIR WILLIAM CROOKES ULTIMATE ANTI-GLARE GLASS CO., LTD.,

30, WIGMORE STREET, LONDON, W.

REMEMBER THE SUFFIX—ULTIMATE.

FINEST
ROUGH CYLINDER BLANKS,

Also good 2nd Selection
A very attractive proposition for Export and cheaper work.

CHANCE'S GLASS USED.

ACTUAL MANUFACTURERS
ASSOCIATED OPTICAL WORKS, Ld
5, Queen's Buildings, London, W.1
Near Tottenham Court Road.
No Connection with any other Firm. Telephone: Museum 2216.

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,
DANDURAND BLDG., MONTREAL.
Cable "Optical" A.B.C. Code 5th. Edition.

C. SWAIN, Ltd.,
51, Strand, London.

A B C Code 5th Ed.
'Phone:—GERRARD 5178. Factory: FOREST GATE.

UNCUT
Sphs
Sph Cyls
Piano Cyls

A.O.C. EDGED
Peris & Bi
Cx & Co etc.,

at Best Prices.

THE MARK OF
QUALITY AND RELIABILITY

ELLIOTT'S
Revised
Rx Price List

on application to

Elliott Optical Co.,
104 & 105 GT. SAFFRON HILL,
LONDON, E.C.1

Elliott's Rx Service is What You are Looking for.

Canadian Goggles.

American Styles, made in Canada to supply demand for British goods. A full line of colored lensed goggles in metal and zylo frames, with and without leather, metal and collapsible dust shields for motor, motorcycle, all out-doors, all industrial uses.

Send for Catalogs or Samples.

CANADIAN GOGGLE Co.,
Manufacturers,
37-39 King William St., HAMILTON, ONT.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

LIQUIDATION. Large stock un-cut lenses, frames, mountings, and repair material for disposal. Enquiries solicited. Dutton, Armstrong & Co., Accountants, 4, Piccadilly, Manchester.

FOR SALE. Half-plate stand camera, mahogany, 16" ext. Beck-Steinheil Unofocal Ser. 1., No. 5. *f*/6 with Beck Celverex shutter, T,B to 1/80 sec, 3 mahogany double dark slides, stand, focusing cloth, waterproof case, the whole £3 10s. Also ¼-plate Holborn reflex, magazine 12, Ilex. R.R. *f*/77. T. and I to 1/100 sec. Leather case, £2. Please address, Box 3475, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

PARTNER Required for high-class business in Dublin. Must have a thorough knowledge of sight-testing and visual optics generally. Age not to exceed 25. Box Optician, c/o McConnell's, 10, Great Brunswick Street, Dublin.

WANTED, Partner with experience of sight-testing, suit young man with small capital studying for the S.M.C. examination. Good prospects, business already established some time. Write, Box 3484, c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 8*

GLAZIER, female, shortly disengaged, requires situation, piece-work preferred. D.D., 80, Garthorne Road, Forest Hill, S.E.23.

RECEPTIONIST. Young Lady, 21, experienced shorthand typist and general office routine, 5 years with leading firm of opticians. Box 5085, c/o "The Optician," 125, Fleet Street, E.C.4.

WHOLESALE Rx house require first class rimless fitter, cutter and glazier, expert checker and order clerk for stock room. Apply Box 5091, c/o "The Optician," 125, Fleet Street, E.C.4.

The Optical Society.
President: Mr. R. S. Whipple, M.I.E.E.
Vice-Presidents: Prof. Frederic J. Cheshire, C.B.E., Director of the Technical Optics Department of the Imperial College of Science and Technology, South Kensington; Sir Herbert Jackson, K.B.E., F.R.S.
Hon. Treasurer: Mr. I. G. Aitchison, B.A., LL.D.
Hon. Secs.: Mr. L. C. Martin, B. Sc., Imperial College of Seience and Technology, South Kensington S.W.7 and
Papers' Secretary: Mr. F. F. Bryson, M.A., B.Sc.

The Society of Chemist-Opticians.
President: Mr. F. S. Horsey
Vice-Presidents Mr. Fouracre.
Hon. Secretary: Mr. J. Harcombe Cuff, Friern Barnet Rd. New Southgate, N. 11 Telephone Finchley
THE SUPPORT OF ALL CHEMIST-OPTICIANS IS EARNESTLY INVITED.

NO! *We are Not* a Prescription House in the true sense of the word — BUT —
"OPHTHALMIC LENS WORKERS"
You send your BLANKS to us, and we GRIND, SMOOTH, POLISH, etc., to instructions, and return for you to Glaze and fit to Frames.
THUS HELPING YOU TO MAINTAIN YOUR Rx SERVICE.
TWO DELIVERIES DAILY. F. ELEY & Co., 110. King's Cross Rd., W.C.1

Manufacture Mécanique de Lunetterie & d'Optique
LIZON & Cie. at Morez du Jura — France. —
Formed by the amalgamation of the old firms:—HENRI COLIN FILS
ALPHONSE BUSSOD-ORY ANDRE CAMELIN LES FILS LOUIS LIZON
LOUIS ARBEZ GUY BUFFARD EMILE MANDRILLON
EYEGLASSES & SPECTACLES high-class goods in any metals and materials, any supplies for fitting and repairing spect. (straight and cable temples)
Clips, Rimless, Fits-u (Rivets, Screws, Crowns, Springs), D Eyes Spect. Frames with Collapsible and Folding Gauze Cups. Motor Goggles.
Optical Lens Manufacturers—Wholesale Only.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Prefix is alright but what really counts is

THE SUFFIX

Crookes glass dates back to say 1913, and made by anyone is original and genuine, but it is important to remember that applies only to Sir Wm. Crookes A and B Glass. Since that date much water has flowed under London Bridge and Sir William only ceased his labours when he brought out his *Ultimate* Glass—the result of his long years of research. The only genuine Crookes Ultimate is made by—

SIR WILLIAM CROOKES ULTIMATE ANTI-GLARE GLASS CO., LTD.,

30, WIGMORE STREET, LONDON, W.

REMEMBER THE SUFFIX—ULTIMATE.

FINEST

ROUGH CYLINDER BLANKS,

Also good 2nd Selection
A very attractive proposition for Export and cheaper work.

CHANCE'S GLASS USED.

ACTUAL MANUFACTURERS

ASSOCIATED OPTICAL WORKS, Ld

5, Queen's Buildings, London, W.1
Near Tottenham Court Road.
No Connection with any other Firm. Telephone: Museum 2216.

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,

DANDURAND BLDG., MONTREAL.
Cable "Optical" A.B.C. Code 5th. Edition.

C. SWAIN, Ltd.,

51, Strand, London.

A B C Code 5th Ed.
'Phone:—GERRARD 5178. Factory: FOREST GATE.

UNCUT
Sphs
Sph Cyls
Piano Cyls

A.O.C. EDGED
Peris & Bi
Cx & Co etc.,

at Best Prices.

THE MARK OF

QUALITY AND RELIABILITY

ELLIOTT'S

Revised

Rx Price List

on application to

Elliott Optical Co.,

104 & 105 GT. SAFFRON HILL,
LONDON, E.C.1

Elliott's Rx Service is What You are Looking for.

Canadian Goggles.

American Styles, made in Canada to supply demand for British goods. A full line of colored lensed goggles in metal and zylo frames, with and without leather, metal and collapsible dust shields for motor, motorcycle, all out-doors, all industrial uses.

Send for Catalogs or Samples.

CANADIAN GOGGLE Co.,
Manufacturers,
37-39 King William St., HAMILTON, ONT.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

***A*.—Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 0d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

WANTED at once setters and checkers. Apply, Kirk Brothers, 36, Gray's Inn Road, W.C.1.

SURFACER requires situation, used to best prescription work, life-time experience, age 36. Ex-service man, good references. W. H., 1a, Ebenezer Buildings, Rotherfield Street, N.1.

QUALIFIED Optician, F.S.M.C., F.I.O., practical watchmaker, keen salesman, desires responsible position in optics or jewellery-optics business. Immediate engagement. Box 5081, c/o "The Optician," 125, Fleet Street, E.C.4.

JEWELLERY, first assistant, must have knowledge of optics, qualified preferred. Manchester district. Full particulars. Box 5080, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. Thoroughly capable manager desires change. Branch management preferred, used to full control. O. & S. methods. Integrity and careful service, married, aged 35. Apply, Box 5079, c/o "The Optician," 125, Fleet Street, E.C.4.

LONDON or Provinces. Position required by young lady in retail opticians. West End experience in all prescription and counter-work. Knowledge of glazing and rimless fitting. Box 5084, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. seeks re-engagement as managing assistant in good class consulting business. London interview. Box 5090 c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Competent and experienced sight-testing assistant. P. Harrison, F.B.O.A., 120, Commercial Road, Portsmouth.

ASSISTANT, age 21, with 5 years' experience in sight-testing seeks situation. Good appearance and conscientious worker. Box 5089, c/o "The Optician," 125, Fleet Street, E.C.4.

INSTRUMENT Test room assistant, intelligent and ambitious requires permanency. Any capacity, 12 years' instrument work, factory routine, administrative work, etc. Box 5088, c/o "The Optician," 125, Fleet Street, E.C.4.

SMART Assistant required, good refractionist with bench experience. Send photo, references and full particulars. Ryan, 30a, Lower O'Connell Street, Dublin.

ASSISTANT for front counter, must be good frame fitter and adjuster (with knowledge of photography preferred), and possessing undeniable references. Address, giving full particulars of experience, age, salary required, etc., to Mr. Reid, 3, Queen Street, Exeter.

POSITION required by energetic man (24), single, partly qualified. Go anywhere, but in or near London preferred. Sound knowledge of optical business routine, good sight-tester, excellent references. Box 5087, c/o "The Optician," 125, Fleet Street, E.C.4.

OPTICIAN, holding F.S.M.C. diploma desires position in good retail establishment, good appearance, reference present employer. Box 5086, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACER, 24, seeks position London or suburbs. Accustomed to prescription work. T.D., 251, East India Dock Road, Poplar, E.14.

ASSISTANT required to take charge of a small branch in a Surrey county town, one with diploma preferred. Must essentially be energetic and possess good business acumen. A good opportunity for the right applicant. Apply, stating experience to Box 5082, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, young lady assistant, capable of doing a little testing, North. Good opportunity to gain experience. State full particulars, lowest salary, etc. Box 5083, c/o "The Optician," 125, Fleet Street, E.C.4.

CAPABLE Surfacer, single, disengaged, seeks situation. Any locality, moderate wages. Apply, W. Collett, Dunton Green, Kent.

POSITION required by experienced sight-testing assistant (21) with photographic experience. Competent and careful tester. Disengaged. Reply, J. W., 15, Freme Street, Everton Road, Manchester.

YOUTH, 17, seeks apprenticeship with optician or instrument maker in London. Good references. No premium. J. Applin, 36, Greenham Road, Muswell Hill, N.10.

CAPABLE Refractionist desires change. All-round Rx hand. London or Manchester preferred. Sober, reliable. Box 5078, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION wanted by refractionist, 34, tall, 12 years' London and provincial experience. Enterprising and reliable. Disengaged. Box 5077, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST seeks position where further instruction could be gained in ophthalmoscopy, etc. Well up at repairs, fitting, etc. Moderate salary. Box 5076, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Lady, age 20, seeks situation as invoice and accounts typist, 3½ years' experience, excellent references. W.W., 52, Fitzroy Road, Regent's Park, N.W.1.

YOUNG MAN with thorough experience of sight-testing and photography, requires position. Entering B.O.A. exam. in November. Age 28. Box 5069, c/o "The Optician," 125, Fleet Street, E.C.4.

"ONLY in experience is there truth (Kant)." Manager, qualified, 12 years' experience desires permanency. Box 5068, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, situation as first-class all round gold worker and jobber. Good references. Address Box 5067, c/o "The Optician," 125, Fleet Street, E.C.4.

LADY Refractionist, qualified, requires post, fully experienced. North preferable. Box 5658, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. 30 years of age, with 12 years' pharmacy experience, requires position with optician or chemist-optician. Good salesman and good references. Box 5670, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION required by young man, 28, as manager or first assistant, 10 years' experience. Good salesman. Capable in all cases of refraction, both S. & O. Apply, Box 5666, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUTH, age 18, just left school, passed senior Oxford Local Examination, 1920, desires apprenticeship with good class optician. Midlands preferred. Apply, T. J. Boulter, 82, Barbourne Road, Worcester.

POSITION wanted by qualified assistant, capable of taking charge. Within 20 miles Walsall preferred. Box 5674, c/o "The Optician," 125, Fleet Street, E.C.4.

TRAVELLER, optical, with connection on South ground seeks engagement. Box 5661, c/o "The Optician," 125, Fleet Street, E.C.4.

SHELL spectacle maker. All round situation required. Write S. Clarke, 37, Millais Road, Leytonstone, E.11.

SIGHT-TESTING optician, extensive experience, good retinoscopist and salesman, thoroughly practical and reliable, disengaged. Reply, Optician, 49, Hazlewood Avenue, Newcastle-on-Tyne.

Concluded on page 6.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE MIDGET



OPERA GLASS.

(Actual size of Illustration.)

Perfect Interpupillary Adjustment.
Superior Lenses.

Claims immediate attention and commands ready sale.

Choice variety:—BLACK MOROCCO, GILT, FANCY LEATHER, PEARL, etc.

WRITE FOR SAMPLE.

R. ARCHER & SONS, Ltd.,

1, AMWELL STREET, LONDON, E.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

AMERICAN·OPTICAL·COMPANY, LIMITED

Wellsworth Eyeglass Chains

For beauty, neatness, service, strength and inconspicuousness, Wellsworth Eyeglass Chains stand out as leaders. They are of a quality unexcelled, and stand the test of hard and continuous use in a creditable manner.



Only materials of the highest grade are used for the production of Wellsworth Eyeglass Chains. This together with careful and skilled workmanship make them of the finest quality.



WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C.4. (Printed by The Century Press, Fulham.) Oct. 7, 1921.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT-MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1594 FRIDAY, OCT. 14, 1921.

ROSS LENSES AND BINOCULARS.

There are no finer instruments obtainable than Ross Lense and Ross Stereo Prism Binoculars. The name of Ross is a guarantee of their quality.

A generous supply of advertising literature and showcards is supplied to all Ross dealers.

Send for our new catalogues and terms.

ROSS Ltd., Clapham Common, LONDON, S.W. 4

ELLIOTT'S Rx SERVICE

leaves nothing to be desired.

ACCURACY PROMPTNESS and REASONABLE PRICES.

104/5, GT. SAFFRON HILL, E.C. 1



ARCHER LORGNETTES

IN GOLD AND TORTOISESHELL WITH THE AMWELL STREET FINISH

R. ARCHER & SONS, Ltd.,
1, Amwell Street, London, E.C.1

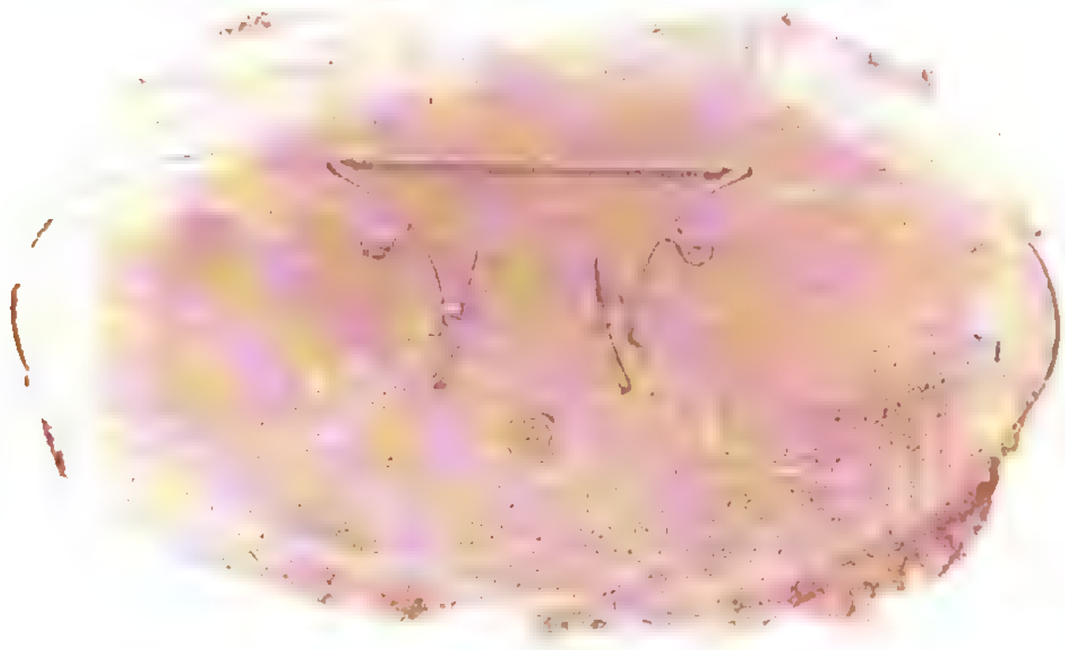
Reg'd at the G.P.O. as a newspaper **PRICE 4d** *Subscription post free 12 months* **17/-**
Postage in United Kingdom **1d**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

AMERICAN·OPTICAL·COMPANY, LIMITED.

WELLSWORTH BRITISH STYLES OF

GOLDFILLED EYEGLASS MOUNTINGS.



1795L. LIGHT WEIGHT RIMLESS ASTIG MOUNTING.

These Mountings are excellent examples of Wellsworth workmanship. Made up in the most popular styles and of a finish that is unexcelled.

This material is a known quality, as is true of all Optical goods bearing the AOCo. Trade Mark, and true to assay.

We have a stock of all popular sizes and your wholesaler can give you prompt service on your Rx work.

1793—1



Light weight flexible guard.

1793—2



Light weight rocking guard.

WELLSWORTH

TRADE (A) MARK (Regd.

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

GEORGE CULVER LTD

Manufacturing Opticians,

JOBBING AND PRESCRIPTION WORK

ACCURACY,

NEATNESS,

PROMPTNESS

Large and full stocks of English made Lenses of all combinations. Orders can be executed promptly.

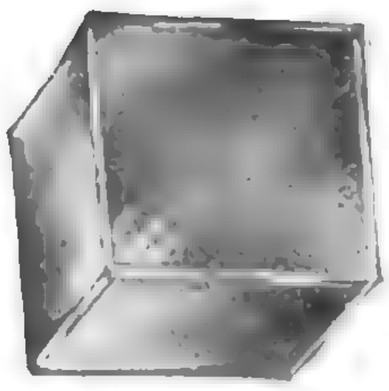
OPTICAL WORKS:
WHITE LION STREET,
PENTONVILLE,
LONDON, N. 1

TELEPHONE:
NORTH 369 and 871

Digitized by Google

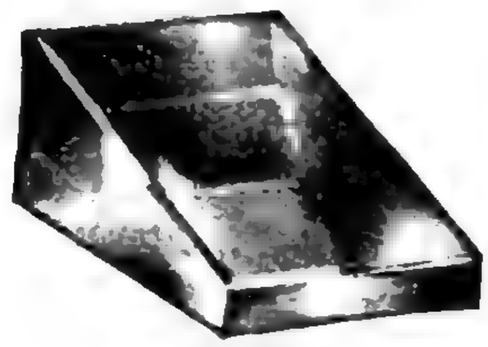
Original from THE OHIO STATE UNIVERSITY

J. & R. FLEMING LTD.



9031.

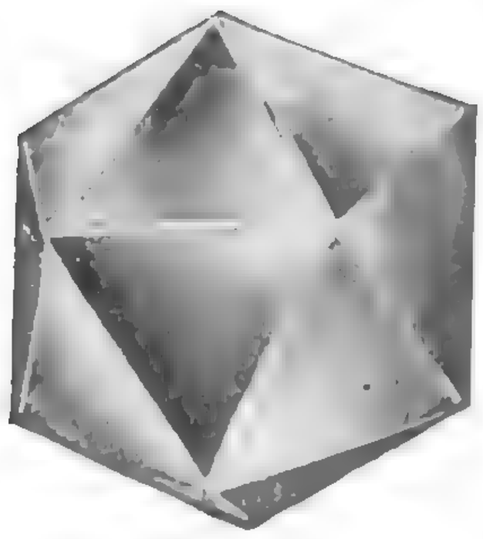
Glass Display Stands.



9033.

We have a large variety of glass display stands of different shapes in white and three colours.

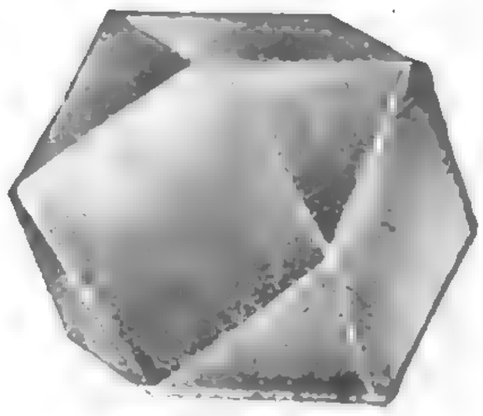
Particulars and Price List on Application.



9041



9050.



9042.

J. & R. FLEMING LTD.,

Telephone :
HOLBORN { 814 / 815
HOLBORN { 2788 / 2789 } Prescription Dept.

136-148 Clerkenwell Road,

LONDON, E.C. 1.

Telegrams :
"OTTICO." LONDON.

Branches with Prescription equipment :

WALTER BRAHAM & Co. Ltd.
6, Key Hill Drive,
BIRMINGHAM.
Phone: Central 2508
Telegrams: "Brahma."

37, WESTGATE STREET,
CARDIFF.
Phone: Cardiff 44
Telegrams: "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1085.
Telegrams: "Ottico."

8, SHUDEHILL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
Col. & Ald. Sir CHARLES C. WAKEFIELD, Bt., C.B.E.

Upper Warden
The Rt. Hon. VISCOUNT HILL.

Renter Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Director of Examinations
The Rt. Hon. Sir WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS

of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., on Oct. 31st, 1921, and during the first week in November.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,594

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, OCT. 14, 1921.

Trade Advertising.—Manufacturers and merchants who are alert to win business on a competitive basis, must advertise. From trade publicity, all may derive some measure of advantage; and only those houses doing what is called an old-fashioned trade, enjoying the regular patronage of a limited circle of customers, can afford to neglect it. For years past, old-fashioned businesses of that type have been steadily displaced by the introduction of progressive methods. For progress, increasing turnover, usually lessens prime costs and thus permits a more attractive service. Thus the only question now is, not *whether* to advertise to the trade, but *how* to advertise. And there are only two ways of distributing the necessary printed matter—by advertising in the trade newspaper or by distributing circulars through the post. The latter is inferior.

* * *

Manufacturers' mailing lists may be the outcome of a great deal of careful work, and correction by means of all the latest available directories; but in most instances they fall very far short of that completeness which is

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

reached in the private directory of a well-established weekly trade journal. For in the office of such a newspaper, the revision and extension of the lists of addresses is regarded as almost the most important of the duties performed. The very large expense is warranted by reason of the co-operative nature of the undertaking. Co-operation with manufacturing and wholesale firms is the essential basis of trade journalism; and a given amount of productive publicity is obtained in this way, for a mere fraction of the cost of issuing circulars independently. Firms using this method save a substantial amount of money; and the reduction of expense puts them in a position to sell goods more cheaply.

* * *

N.B.—With that object in view, the best and much the most economical medium is afforded by the forthcoming (semi-annual) Special Issue of *The Optician and Scientific Instrument Maker*, to be published on the 28th inst. The circulation of this issue will cover the shipping houses in the home market, and the leading importers on the Continent of Europe, in South America, South Africa, Australia and the Far East. It is our own medium of advertising our paper on an extended scale, and provides an opening for collective trade publicity for prescription houses, manufacturers and shippers, that is unrivalled.

* * *

Northampton Institute Lectures.—A course of six experimental lectures, introductory to the ordinary work of the Optical Engineering and Applied Optics Department at the Northampton Institute, is announced in our advertising columns. Professor Cheshire, C.B.E., will deal with "The Eye and Man's Work in Assisting it," and with "Polarised Light and Polarisation Apparatus." Mr. H. H. Emsley, B.Sc., will discuss "Some Optical Munitions of War" and "Some Applications of Optics in Engineering." Mr. C. L. Redding will lecture on "The Human Eye: A Living Organ." Time is to be left for questions and discussion at the end of each lecture. The attendance fee is only 2s. 6d. for the series, or 9d. for any single lecture.

* * *

Expressions of Opinion.—Since writing on the subject last week, we have been favoured with several further letters taking us severely to task on account of our alleged responsibility for statements made in certain advertising matter upon pages xiii. and xiv. in *The Optician* of September 30th. Now as is usual in trade and professional newspapers, all editorial responsibility is expressly disclaimed for such statements as are made in our correspondence columns. *A fortiori* we are entitled to repudiate and resent the attribution to this paper as an organ of opinion, of assertions made by advertisers in our advertising columns. Our responsibility goes thus far and no further: We exclude libellous matter from publication in any part of the paper; and we exclude unnecessarily offensive remarks, directed against any individual, from our correspondence columns. (The most incisive of criticisms can be phrased as well, and perhaps with fuller effect, in temperate as in angry terms). Moreover, we decline to print any unpleasant "personalities" in our correspondence columns over a pseudonym. The reasonableness of a newspaper publisher's attitude (thus defined) being admitted, as it must be; we believe it will further be admitted that we live up to the requirements of the position defined. One criticism only we have to meet, which is that the advertising pages are not clearly enough differentiated from the text pages of this paper. The difference is marked, as is usual in trade newspapers, by the use of Roman numerals instead of Arabic for the advertising sheets. *In future we shall make the distinction still clearer by addition of the word, "Advertisements."*

* * *

Optical History.—A good deal turns on questions of the credit rightly to be ascribed to different individuals and institutions, for the remarkable development in this country of optometry as a profession, within say the past thirty years. Some little credit, might perhaps be claimed for *The Optician* itself, as having been established in April, 1891, as the medium of intercommunication between all opticians, for the furtherance of their industrial interests and the advancement of their professional claims. Without a publicity reaching all sections of the trade, it is not possible for any movement intended to extend our organisation and professional and commercial success to attain its full ends. However that is not the point we mean to dwell on. In one of the letters which has been addressed to us as above mentioned, reference is made to the interesting fact that some forty odd years ago, it is believed that the present-day method of having a sight-testing room in which each eye is separately examined, was inaugurated by Mr. T. Henri, who has now attained the ripe age of 81, and is we are pleased to learn still hale and hearty. Mr. Henri is said to have taught the business to a

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

very well-known and successful ophthalmic optician, now deceased, who is named by our correspondent. The first introduction of the sight-testing room in an ophthalmic optician's business premises is certainly a matter of much interest. We should be pleased to have any further correspondence on the point, though preferably not over a pseudonym, unless indeed entirely free from any other matter which is unsuitable to publication in that form. A letter referring to the points which we have brought in issue is published this week from Mr. E. G. Guyatt, because he has had the courage, and if we may say so honesty, to append his name and address to his criticisms.

Big orders and important contracts result from advertising in Trade and Technical Journals. The B.A.T.T.J. Handbook is a valuable guide, giving just the particulars an advertiser needs. 1s. post free of the Secretary, British Association of Trade and Technical Journals, Ltd., Sicilian House, Southampton Row, London, W.C.1.

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

Dioptric Powers.

Sir,—We shall be glad if you will allow us space to reply to the remarks of your correspondents, calling attention to the variations due to the wearing of glasses at distances other than the distance at which the test was made.

You were good enough to announce recently the fact that we were attempting to set up a standard for meniscus form lenses.

This necessitated a standard distance and 15 mm. has been chosen, rightly or wrongly, as the best and most usual distance for testing and wearing.

Obviously, it would be impossible for manufacturers who grind these lenses in quantities to provide for all distances even if the information were forthcoming.

UNITED KINGDOM OPTICAL CO., LTD.,
A. H. EMERSON, *Director.*
Mill Hill, London, N.W.7.

An Apotheosis.

Sir,—I hope you will find it possible to publish the enclosed. It is addressed to the author, rather than to the subject of his eulogy.

"Dear 'We,'—You will pardon this somewhat unusual form of address, but it is all that you give one to get hold of. If I call you 'Sir' I may be wrong, and so I may if I call you 'Madam.'

"So I gather that it was in 1906 that the 'Nation's eyes were in peril.' I don't know what that phrase means, but it is the year that intrigues me. The event is not mentioned in any calendar, neither does my meagre knowledge of history enable me to trace the concatenation of circumstances which led us to the brink of such an awful peril in that dread year. But there it is, plainly set down in *The Optician* for future historians to note.

"For me, it is sufficient to know that at the critical moment the right man—dare I say it --blossomed forth. It has happened once or twice before in history, but do not let us be blinded to the wonder of the event by reason of the comparative modernity. Let us rather be thankful that the great man didn't happen to be in his native country at the time, for surely we would have suffered a calamity 'such as this old country had never known before.'

"You tell us that 'Bloom publicity' was something new, and one is prepared therefore, to accept the further assurance that it was original; but one would like to know how an innovation falls like a bombshell!

"Your statement that 'qualified,' as applied to Bloom employees, does not necessarily mean that they hold diplomas, is rather superfluous, seeing that a recent court case is still fresh in our memory. But I will try to follow you a little further. You suggest that a diploma represents theory, and you say that 'experience is just as essential as theory.' It follows, therefore, that the knowledge for which a diploma is granted (which you call 'theory,' heaven only knows why) is as essential as experience. Hence your reasoning leads to the conclusion that at least eight of Mr. Bloom's establishments are run by managers deficient in something which you consider essential. And yet you say they are 'qualified and practical.' Rather muddled, isn't it?

"Another striking phrase is, 'the name of the firm stands for super-efficiency.' To us poor mortals who are striving to become efficient, it is indeed disheartening to find that after all *that* represents but a very low rung on the ladder of success. A 100 per cent.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Efficiency Exhibition becomes a mere kindergarten affair.

"Now, it is all very well for you to say that we *must* consider Optics, Ltd., and Bloom's, Ltd., as separate interests; but in some recent correspondence Mr. Bloom himself stated that his low prices were possible because of 'mass *production.*' Said Mr. Bloom, 'He (the correspondent) loses sight of the fact that we are the largest buyers and among the principal *producers* in this country!'

"Having revolutionised the optical trade of Great Britain, one isn't surprised to hear that the World's optical trade is doomed to the same fate shortly. Indeed, it seems as if the whole Universe is in for a rough time, for 'this energetic young man of 39,' 'this human dynamo,' 'this Napoleon of the optical industry,' this 'presiding genius,' 'this wizard of the optical industry,' is now free to conquer any other jolly old world that doesn't happen to have the 'Bloom atmosphere.'

"In conclusion, permit me to make a suggestion. It appears that much has been done in our interest by the aforesaid; but instead of offering thanks, we have made bitter attacks. Let the optical trade of Great Britain make amends. Why not add to the silver loving cup and illuminated address, say, a portrait in oils or marble bust, inscribed, 'Maurice Bart Bloom, Esqr., Maker of History and of Vincoray Lenses?' "

E. G. Guyatt, D.B.O.A., F.I.O.
143, High Street, N., East Ham, E.6.

Early Sight Testing.

Sir,—Mr. M. B. Bloom's announcement in *The Optician* is quite wrong in the first three paragraphs. Mr. Bloom *never* reorganised the system of sight-testing and he is not the pioneer of the present system of eye-testing.

Some forty odd years ago, a gentleman commenced business as a sight-testing optician under the name of "T. Henri." He inaugurated the present day method of having a sight-testing room and examining each eye separately. He taught the business to such a well-known man as the late Mr. Aitchison, and he was in business in Aldersgate Street, Northumberland Avenue, etc. Even now at the ripe old age of 84 this gentleman is hale and hearty, and carrying on business in a certain part of London. I admit that Mr. Bloom has opened many branches of a big business and advertised it well, and he may have done a big service to the public. Further he may be a good employer.

Let him, however, keep strictly to facts in his trade and public advertisements, and no one is likely to oppose him. Give honour where honour is due.

He has *not* relegated the system of sight-testing—which is *not* out of date—to the scrap heap and is not the pioneer of the present system. He must give the palm to the grand old man of 84 who, by the way, is not carrying on business under the name by which he was so well-known for many years in the City.

Fairplay.

Forest Gate, E.7.

Messrs. T. Cooke & Sons' Instruments.

From Messrs. T. Cooke & Sons, Ltd., Buckingham Works, York, we have received for notice a copy of their latest "General Catalogue and Manual" just issued. This is a very handsome volume, over 200 pages, strongly bound, which not only describes and illustrates a great variety of scientific instruments, but includes a technical introduction dealing with internal focusing systems and the anallatic method, with stadia lines in surveying instruments, effective diameters of telescope object glasses, determination of magnifying power and angular field, collimation errors, diaphragms or graticules, divided circles, centesimal graduation, verniers, spirit levels and other component parts of theodolites and tacheometers. This gives the catalogue a general interest for technicians, apart from the detailed descriptions of a great variety of scientific instruments manufactured by Messrs. Cooke & Sons. All prices of instruments illustrated and described are to be referred to in a separate pamphlet (inset), as is, we think, the best way of dealing with prices, for several reasons. The offices of the firm in London are at 3, Broadway, Westminster, S.W.; and in other towns they are represented by Messrs. Vickers, Ltd.

The third Ettles Memorial Lecture will be delivered on Thursday next (the 20th inst.), at the Hall of the Royal Society of Arts, 18, John Street, W.C. The lecturer is Dr. Charles Sheard, M.A., Ph.D., of the Scientific Staff of the American Optical Company, who is editor of the 'American Journal of Physiological Optics.' Dr. Sheard has chosen for his subject, "The Comparative Values of Various Methods and Practices in Skiametry." Invitation cards are to be sent to all members of the Institute of Ophthalmic Opticians as well as to other opticians interested. The Hon. Secretary of the Institute of Ophthalmic Opticians is Mr. J. Harcombe Cuff, Staple Inn Buildings, Holborn, W.C.1.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

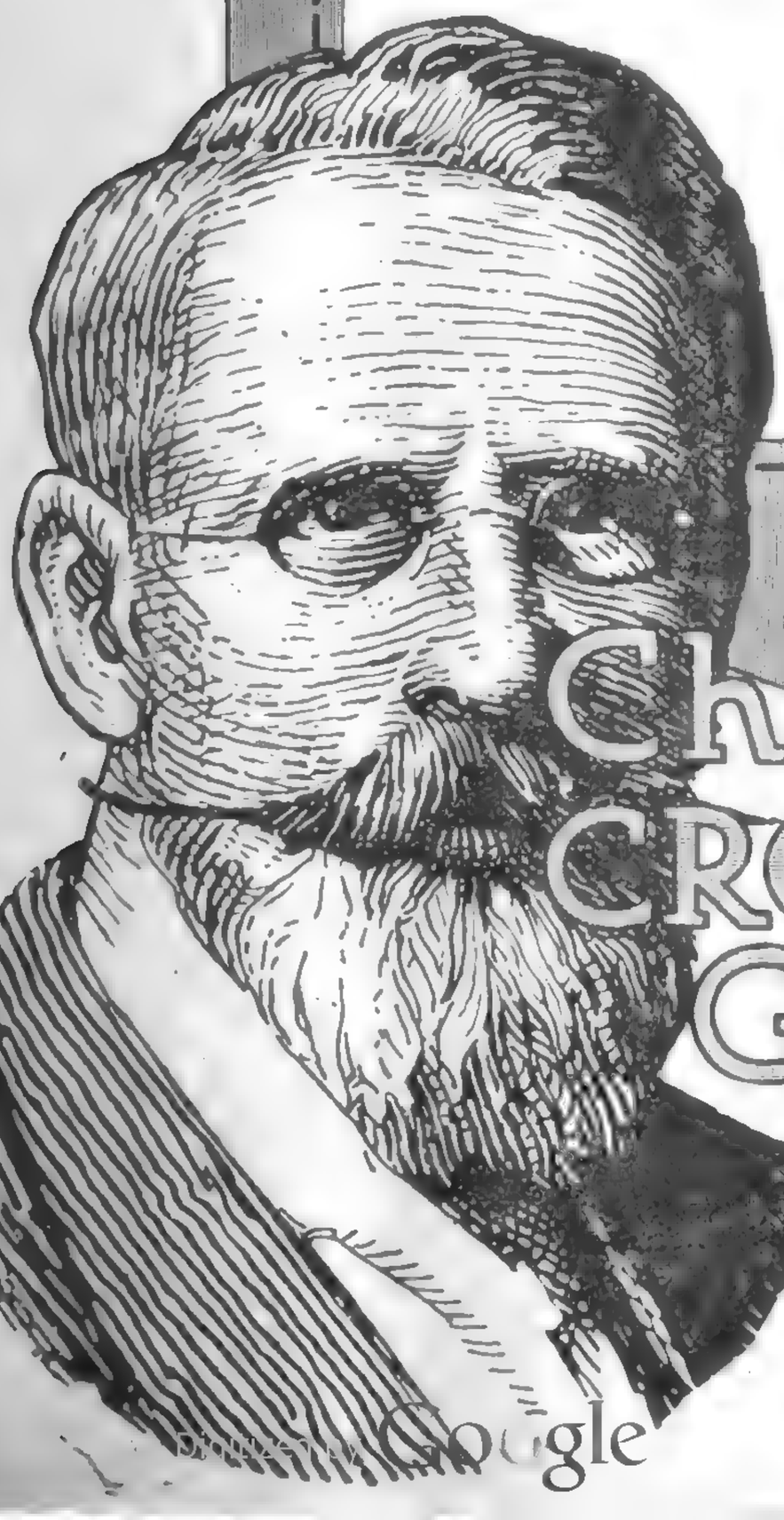
Reasoned Publicity

The readers of "local papers" respond to good advertising no less than the readers of the most famous periodicals; and they are equally appreciative of well designed illustrations and neat display. For this reason (and because the Optician is often his own publicity adviser, but cannot always spare the time necessary to design telling layouts) we have had prepared a special series of small-space advertisements to be used with the Optician's name and address. These are ready in type (name and address only requiring to be added) and a good display is assured. You can secure free, by writing to us, advertising matter of a quality which would be very expensive if you procured it independently.

We can sincerely recommend to all progressive Opticians this series of advertisements.

A line to us will bring you all information.

CHANCE Bros. & Co., Ltd.
Glass Works,
Smethwick, Birmingham.



Chance's CROOKES' Glass

AN INSTRUMENT IS NOW ON SALE TO DEMONSTRATE TO THE PUBLIC THE EFFICACY OF CHANCE'S 'CROOKES' GLASS IN CUTTING OFF THE HARMFUL LIGHT RAYS

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

If You Want Speed—
You Want Us.

TO most firms a rush job is not a fair test of the Service they can give.

To us it is.

The actual mechanical part of the work is not rushed. We have simply succeeded in reducing all intermediate delay to an irreducible minimum.

We employ an efficient and adequate staff. If a job requires two hours' work we are confident that two hours is the shortest time in which the work can be executed in a proper and satisfactory manner.

Our system of dealing with orders enables us to deliver to time without the necessity arising of worrying and rushing our men to the prejudice of the mechanical excellence of the work.

Try us with your next urgent Rx order. We'll accept it as a fair test.

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris, France.

Also at—2, Str-Buresi, Bucharest, Roumania.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

ON DIPLOPIA.

A Lecture by Dr. FREELAND FERGUS, M.D., LL. D., delivered in the Royal Technical College, Glasgow, on the occasion of the Annual Meeting of the National Association of Opticians, August, 1921.

In the first place, I have to thank the Council of your Association for the invitation which I have received to address this meeting on an important subject to which I have given some attention.

Secondly, my thanks are due to the Council in that they have not given me a time limit. I wish with your permission, as a preliminary, to embrace this opportunity of stating as clearly as the circumstances of the case will permit, the views I have long held as regards the position of opticians in reference to ophthalmology as a branch of the healing art. I shall first take up these questions, and that as introductory to the study of diplopia. This address will, therefore, require to be of considerable length, yet I trust that whatever may be my defects as regards matter or manner, that the intrinsic interest of the subjects under discussion, will prevent your suffering from those feelings of weariness that a long address is apt to engender. For my part I shall try to be as little "dreich" as possible.

To begin with, the percentage of patients attending eye clinics who are suffering really from errors of refraction, or from muscular imbalance is enormous—some authors, competent to speak, have placed it as high as sixty per cent. I have never collected statistical data myself, and, therefore, at present I am quite unable to give any figure, but I am well aware that more than half of the patients who come to my consulting rooms, suffer from errors or refraction, or of accommodation, or from muscular imbalance. That this is the case is abundantly shown by the increasingly large number of country practitioners who provide themselves with trial cases of lenses and test types, and who devote some time to the investigation of refraction errors. Not so very long ago such a state of affairs did not exist, and only too often when a patient complained of eye trouble, a prescription for a lotion was written more as a *placebo*, then as an honest attempt to discover the real source of the patient's sufferings.

That has been changed very considerably, for numerous general practitioners are well aware that unless they know a little about optical principles, they are not in a position to treat perhaps more than fifty per cent. of such patients as avail themselves of their services for eye troubles. Hence in recent years text books on ophthalmology, written for medical students or for general practitioners, contain sections dealing with the physical side of ophthalmology; an *ophthalmic* text-book which withholds such information is practically useless to the average modern general practitioner who desires to take an intelligent interest in eye patients. Medical men in general practice and medical students realise, that apart from the physical side of the subject, the rest of ophthalmology is nothing else but an application of ordinary medicine and surgery, including, of course, such subjects as physiology, neurology, and above all, bacteriology. What they are now demanding from ophthalmic teachers is, that courses of instruction shall contain some elementary information on optical principles.

Of course, we all know that accurate knowledge on these subjects has been of very recent date. Modern ophthalmic work on its physical side is mainly due to the writings of Helmholtz and of Donders. Before their time there were numerous physicians and surgeons who devoted very great attention to diseases of the eye. In many cases they were men of great learning, and of profound knowledge of the subject as then understood. They had no reason to be ashamed of their work, nor have we any other feeling than one of deep respect for their labours. But just as Lister's application of Pasteur's researches to surgical work has changed the whole of surgical practice, so has the application of the researches of Donders and Helmholtz to clinical ophthalmology altered almost entirely, and certainly permanently, more than half of ophthalmic practice.

Clinical ophthalmology which excludes the physical side is not ophthalmology at all, but is the application—and not a very special application—of the ordinary principles of medicine and surgery and biology to the treatment of eye diseases. Think of the glorious prescriptions of the past, all the lotions and ointments and drops which were supposed to be essential to treatment! With very few

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

exceptions they are, or ought to be, on the scrap heap. We can produce mydriasis by a mydriatic, and often can do a great deal of good by doing so. Similarly, we may beneficially employ a myotic, and we can produce local anæsthesia by a suitable anæsthetic. There is only one lotion of any value, and that is water made isotonic by the addition of a little salt. We know that zinc sulphate is of use in one special infection of the conjunctiva, and we have not yet got beyond using a caustic of some sort in trachoma. If you want to see how completely matters have changed you have only to look at any standard book of the middle of last century. Such books largely deal with leeching and passing of setons and blisters applied either behind the ear or to the temple. In addition you will find the polypharmacy of the time rampant.

Mackenzie of Glasgow.

The whole of that has passed. No doubt tradition dies hard. One of the best men of the old school was Mackenzie, of Glasgow, who was a strong believer in the old regime of blisters and bleedings. Amongst the things which he gave to the medical world were a series of prescriptions for lotions and drops and ointments. As a proof of the statement just made that traditon dies hard, it may be mentioned that not very many years ago Mackenzie's prescriptions were republished, but I regret to say without any acknowledgement whatsoever of the source. That amongst other things shows that there are isolated instances where the practice of the first half of last century is adhered to with a fidelity which is almost pathetic.

As already pointed out, a very large number of ophthalmic patients are suffering not from what are usually regarded as diseases of the eye, but from natural defects—particularly from errors of refraction, errors of accommodation, and from muscular imbalance. The last of these is closely associated with diplopia —the subject on which your Council has particularly asked me to address you. The question then naturally arises, as to whether the modern optologist is capable of undertaking the treatment of such cases.

Now I admit at once what I know to be true, that on the physical side of refraction testing the modern optologist has as a rule enjoyed an excellent training. During the war I had the services of one of them as orderly in my clinique. Being myself responsible for these soldiers, I personally tested almost all the patients, leaving it to him to measure for and adjust the frames. Sometimes when the pressure of work was great the refraction was in the first instance measured by my orderly sergeant. As, however, I, and not he, was responsible for the work done in that clinique, I all but invariably checked his results, and I must state that the number of cases in which my readings differed from his, was extremely small—a very low percentage. There can be no doubt that the modern optologist is for the most part a man well trained on certain lines.

On the other hand it must be admitted that to a considerable extent the medical eye specialist is a perfectly indefinite quantity; a state of affairs which I think is unfortunate, and which is largely due, if I may say so with all proper respect, to the inaction of the General Medical Council. Many years ago—probably more than thirty—I wrote a letter to the late Professor Leishman, at that time a member of the General Medical Council, urging that the Council should take steps to get full information and thereafter organise ophthalmic matters, so that we should know what is meant by Eye Specialist, just as we know what is meant by a diplomate in Public Health. The learned Professor—and he was a very scholarly man—did not see his way to take any action, and did not bring the matter before the Council.

Training in Ophthalmology.

Since that time I have on many occasions, and in various communications, urged that the eye specialist should be as thoroughly trained in ophthalmology as a diplomate or graduate in Public Health is in that branch of study. On several occasions I have given details as to what I consider a suitable curriculum for such students. I am not going to reiterate what I have said elsewhere, but I would just for a moment have you consider what studies should be included in a course for a practitioner who desires to rank as an ophthalmic specialist. He ought to study in their special applications at least the following subjects, viz.:—The Physiology of Vision; Physics of Light (including the parts of mathematical study necessary for the purpose, e.g., plane trigonometry, rectangular co-ordinate geometry to the equation to the circle, and the elements of the calculus); Pathological Histology; Bacteriology; Neurology in its relation to ophthalmology; Ophthalmic Medicine and Ophthalmic Surgery.

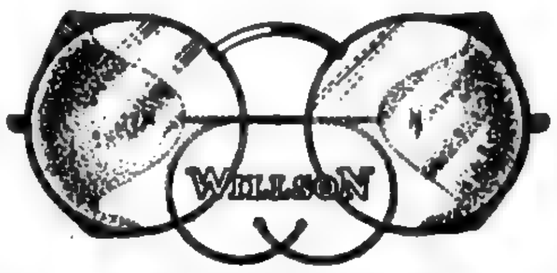
Is a period of three years too long to cover such an extensive field of study? In the main, I think not. Of one thing I am quite certain, and that is no one can ever be a reliable eye

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

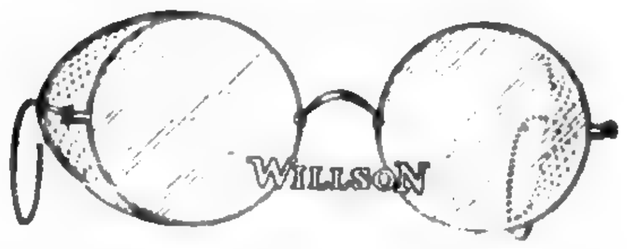
WILLSON GOGGLES

We Invite Correspondence.

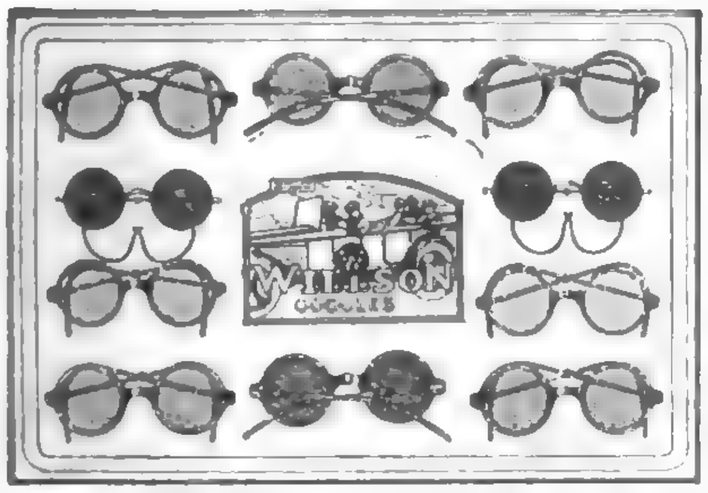
We manufacture goggles for protecting the eyes from sunlight, dust, glare and wind. Also safety goggles for protecting workmen at industrial operations.



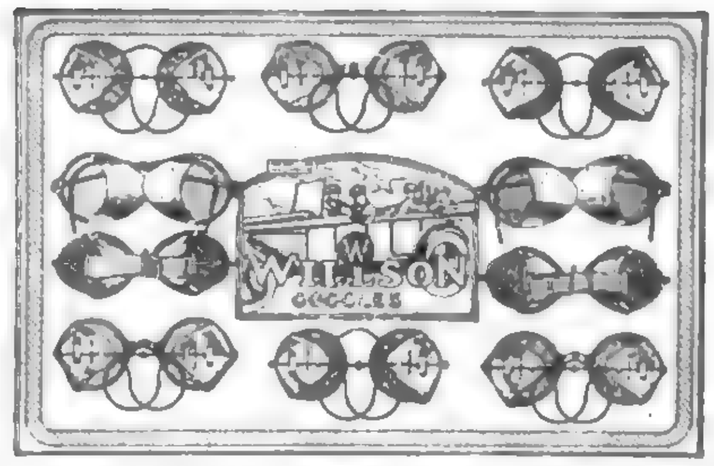
Style A1.—48mm micoquille lenses in amber, fieuzal, smoke and amethyst colors; or clear. Good leather side shields, adjustable bridge and cable temples. Metal case.



Style N88.—48mm micoquille lenses in amber, fieuzal, smoke and amethyst colors; or clear. Perforated metal side shields, saddle bridge and cable temples. Cardboard box.

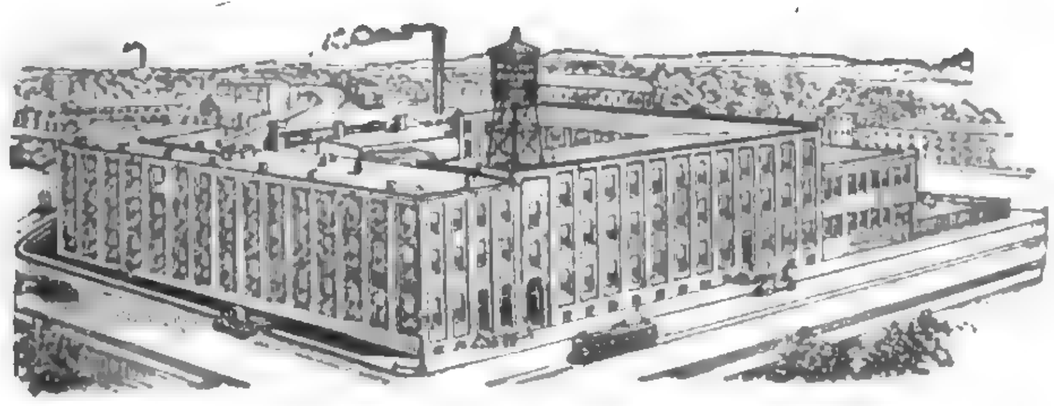


Assortment Y10.—Ten high-grade imitation shell goggles WITHOUT side shields displayed on a heavy, colored artboard with easel. The goggles are sold off this display at a uniform price. Strong shipping container.



Assortment Y15.—Ten high-grade goggles WITH side shields. Assorted styles of imitation shell, white metal and their combinations. Same display board and shipping container.

These assortments have good-quality micoquille lenses in the most popular colors.



WILLSON GOGGLES INC., READING, PA., U.SA.

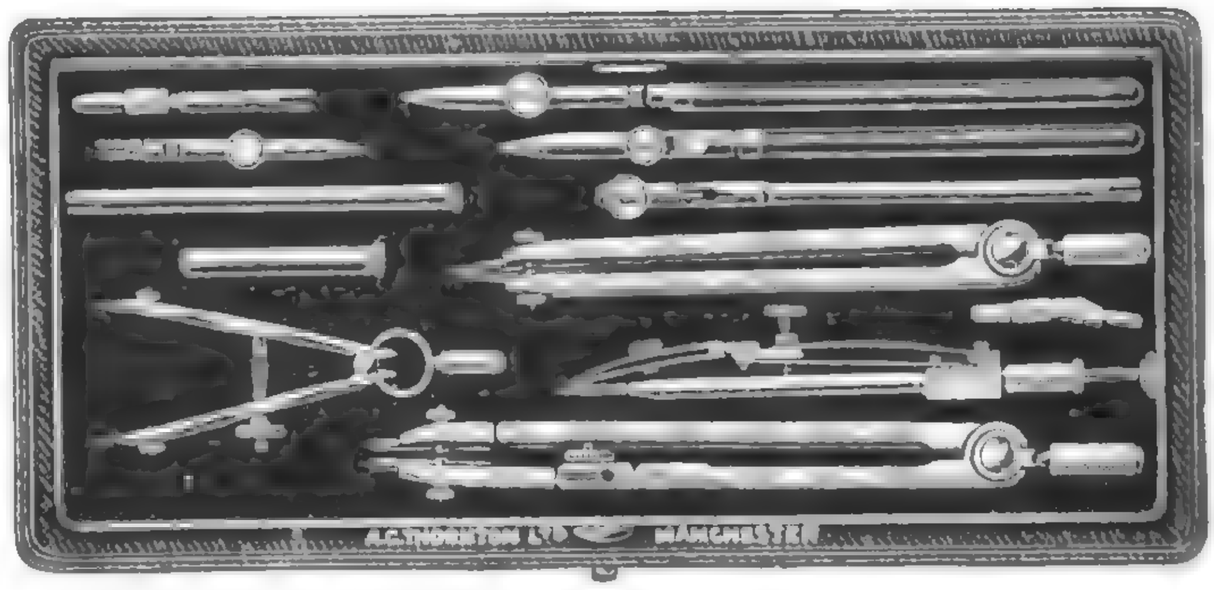
British Office and Warehouse: S. PULZER, 9, Hatton Garden, London, E.C.1

Australasian Representative, WILLIAM LEWIS, Ltd., Stafford House, 316, Pitt St., Sydney.

Largest plant in the world devoted exclusively to the manufacture of eye-protective devices. Trade Mark Registered in The United States Patent Office, Great Britain, Australia, France, Brazil, Argentine, Chile, Bolivia, Peru, Uruguay, Cuba and Japan.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

BRITISH MADE DRAWING INSTRUMENTS



Pocket case of Show Instruments, from 18/9 each.

SPECIAL TERMS TO THE TRADE.

Produced in our Factory at Manchester.

A. G. THORNTON, LTD.

Contractors to the British, Colonial, and other Governments.

PARAGON WORKS,
20, KING ST., WEST,
MANCHESTER.

F. BARKER & SON, LTD.

Registered

SUNDIAL HOUSE,
12, Clerkenwell Road, LONDON, E.C. 1

Trade Mark
Estab. 1848

MANUFACTURERS OF ALL CLASSES OF

SCIENTIFIC AND OPTICAL GOODS.

MANUFACTURERS OF

Aneroid Barometers, Compasses, Drawing, Mining, Surveying & Scientific Instruments of Every Description.

Illustrated and Descriptive Catalogue Post Free to any part of the World. Illustrated Booklet upon Sundials, Barometers and Compasses, Post Free. LISTS FREE.

Correspondence Invited. Bankers' and Trade References.

CLINICAL THERMOMETERS A SPECIALITY

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,

DANDURAND BLDG., MONTREAL.

Cable "Optical" A.B.C. Code 5th. Edition.

The Prefix is alright but what really counts is

THE SUFFIX

Crookes glass dates back to say 1913, and made by anyone is original and genuine, but it is important to remember that applies only to Sir Wm. Crookes A and B Glass. Since that date much water has flowed under London Bridge and Sir William only ceased his labours when he brought out his *Ultimate* Glass—the result of his long years of research. The only genuine Crookes Ultimate is made by—

SIR WILLIAM CROOKES ULTIMATE ANTI-GLARE GLASS CO., LTD.,

30, WIGMORE STREET, LONDON, W.

REMEMBER THE SUFFIX—ULTIMATE.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

specialist who has not as a preliminary passed through the entire medical curriculum, and taken a full medical qualification. Scraps of information on such vitally important subjects will not do. The would-be medical eye specialist must be trained in all the methods of diagnosis, that are in modern practice employed by phyiscians and surgeons. Medicine and surgery throw much light on the work of the ophthalmic practitioner and conversely a thorough going ophthalmic examination is often of great service to the physician and surgeon. Till recently the ophthalmic specialist, in this country at any rate, has not necessarily received any official special training whatsoever. There has been—as it were—no hallmark.

Ophthalmic Diplomas.

In two directions there are signs of official improvement. In the first place several ophthalmic diplomas have recently been established by some of the medical licensing authorities. I am not quite sure as to the adequacy, from my point of view, of some of these diplomas, but certainly a step has been taken in the right direction. Just as any person who has obtained a medical qualification can, by further study, obtain a diploma in Public Health, so it is now possible for any one, who is qualified as a medical practitioner, to obtain by further study a certificate of special knowledge in ophthalmology. But so intimate are the relations between ophthalmology and medicine and surgery, that no one should be allowed to take a certificate of that kind, who has not passed through the ordinary medical course, and who has not had his name placed on the medical register.

The second step in the right direction which has recently been taken is that the General Medical Council has ordained, that before a candidates's name is put on the medical register as that of a qualified medical practitioner, that the candidate must give evidence of having passed an examination in ophthalmology. That is as it should be, but surely any such arrangement must be properly and adequately safeguarded in the public interest.

Ophthalmology in the ordinary medical curriculum occupies only a subsidiary place. At present the student must attend a class which has twenty meetings. Already in this communication an indication has been given of the extent of the subject. Now what is to be feared is this—that persons who have attended these short courses, and who have passed these examinations will imagine that they are competent to set up as ophthalmic specialists. Plainly speaking, they are not. Fancy, having refraction testing, with all that that term implies of optical principles, along with the appearances of the fundus in health and disease, cataract, glaucoma, iritis, conjunctivitis, squint, muscular imbalance—all in a summer session. Nobody can become reliable as a refraction tester unless, as a preliminary, he has studied certain parts of geometric and physical optics, and has had for at least a year, considerable practice in measuring the errors of patients.

The courses taken by ordinary students of medicine should *exclusively* deal with those parts of the subject which are of use in general practice, and the examination should be also similarly limited. Medical students should be taught to handle such instruments as the ophthalmoscope and the perimeter—for these instruments are essential to the physician, and to the surgeon. They should also be taught to recognise such important conditions as glaucoma, cataract, iritis, conjunctivitis, etc. To attempt to teach the special work of the eye specialist along with a heterogeneous mass of other things, will simply be disastrous in the highest degree. We cannot get adequate results with inadequate means, although the attempt is often made.

A Hall Mark Required.

In view of this new regulation by the General Medical Council, it has become all the more urgent that members of the Medical Profession who, after adequate training, have passed thorough-going examinations, should have a proper hall-mark. It might be well if the General Medical Council were, after mature consideration, to indicate those parts of the subject which they very properly think the ordinary medical student should study. I hope that they will deliberately exclude refraction testing and all kindred subjects. The ordinary medical student is, as a rule, an excellent man, but still he is not such a heaven born genius that he can master in three or four months that information on these subjects which other people take at least a year or eighteen months to acquire. Thoroughness is the first requisite in the training of those who are to have the serious responsibilities of practising any branch of the healing art. Soundness of judgment can only be based on soundness of knowledge, and cannot be built on camouflage or on pretence.

Although there has not been up till now any well defined hall-mark, I do not for a moment wish it to be inferred that there has been any lack in the United Kingdom of men amply

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

qualified for work in this special department. There is no doubt that ophthalmic practice has attained as high a level as that of any department of medicine. Till now ophthalmology was studied not with a view of obtaining a diploma, but from the much higher point of view that it is a subject of great intrinsic interest. I just hope that the new regime which seems to be dawning, will give us as good men as many of those who were the leaders in the domain of British Ophthalmic Surgery when I was young.

Examination Questions.

Any attack on British Ophthalmic practitioners of that time would be as dastardly as it would be untrue. The average of proficiency was, and I believe still is, extremely high. That a change is perhaps desirable seems to be indicated by a few incidents which have come under my own notice. A certain honours examination paper was set in ophthalmology, and one of the questions was: "What is the minimum deviation of a prism? Given a prism of 5° minimum deviation, what is the corresponding prism in (*a*) prism dioptres; (*b*) in centradians?" To assist the candidate the tangent of 5° was given. That question would be entirely wrong for an ordinary medical student; but it appears to me to be well within the mark for an honours paper in Ophthalmology. The answer given was to the effect that a prism refracted light towards its base. In a similar paper, *i.e.* an honours one, there was a question as to what is meant by the light difference and light minimum senses, and the clinical significance of defects in each.

Another question in the same paper was on diplopia. It gave the projection of the image of the sound eye as being at the origin of ordinary rectangular co-ordinates and gave the projection of the false image in terms of its *x.y.* co-ordinates. No attempt was made to answer either of these questions. Again, I wish to point out that these two questions, although suitable for an honours paper, would be quite unsuitable for an ordinary medical examination. Has a candidate who is unable to answer such questions any right to be called an eye specialist? The standard of British Ophthalmology is very high, but such exceptional cases as the foregoing, show that the institution of special diplomas, much on the lines of those in the department of public health, is likely to be of public advantage.

Just one other example. In connection with every large hospital there ought to be, and very often there is a consulting ophthalmic surgeon. His services should be of the greatest importance to the physicians and surgeons and neurologists of the hospital to which he is attached. If the work is properly done, its importance can scarcely be exaggerated. In a large town there was an hospital with several hundred beds, and on its staff there was a consulting ophthalmic surgeon. The trouble in this particular case was that the gentleman who held the appointment never consulted, but when a request was made for a consultation invariably a substitute was sent.

On one occasion a patient had received severe head injuries, and one of the symptoms complained of was blindness. It became a matter of great moment to ascertain the cause of the blindness. A consultation was requested, and one of the substitutes duly appeared. That substitute entered in the Ward journal the following report: "This patient is blind." I cannot imagine anything more disgraceful than entrusting a piece of work, so vitally important for the patient, to a person so hopelessly incompetent. One cannot but feel extremely sorry for a capable and conscientious surgeon so severely handicapped in his work by such a deplorably wrong state of affairs. I fear, however, that I have made a long digression. I again say that the average standard of British ophthalmology is extremely high, and it would be very wrong to draw any conclusion from the above extraordinary examples.

The Sight-Testing Optician.

I must now try to answer the question as to the competence of optologists to undertake ophthalmic practice. It is to my mind perfectly clear that outside of the department of refraction work, nobody can be efficient for ophthalmic practice, unless he or she has had a good training in medicine, surgery, pathology, bacteriology and physiology. In other words, he or she must be a fully qualified medical practitioner; without that the ophthalmic specialist will not be a bit better than the venereal quack. But it must be admitted that the optologist has received a very satisfactory training in optics and even in refraction testing which constitutes his particular field of work.

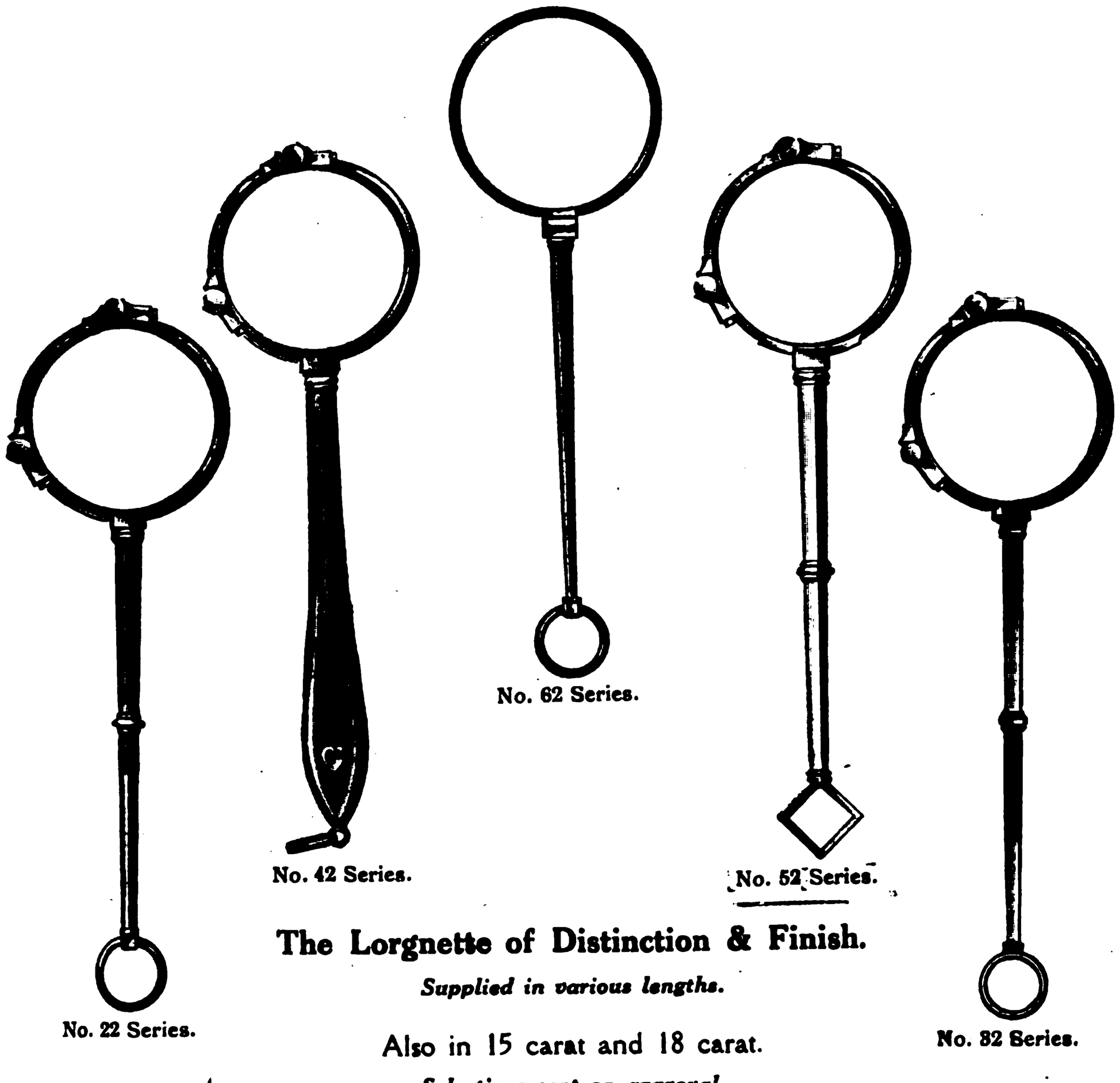
From time immemorial there have been opticians who have fitted clients with glasses. Indeed, till quite recent times such work seems to have been almost entirely in the hands of opticians; the number of medical men who before the writings of Helmholtz and Donders did refraction testing was very limited, practically nil. You are infinitely better prepared for such work than were these old time

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

W.H.T.

9ct. GOLD LORGNETTES.

(OUR OWN MANUFACTURE.)



No. 22 Series.

No. 42 Series.

No. 62 Series.

No. 52 Series.

No. 32 Series.

The Lorgnette of Distinction & Finish.

Supplied in various lengths.

Also in 15 carat and 18 carat.

Selections sent on approval.

WALTER H. THOMPSON

66 HATTON GARDEN, LONDON, E.C. 1.

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

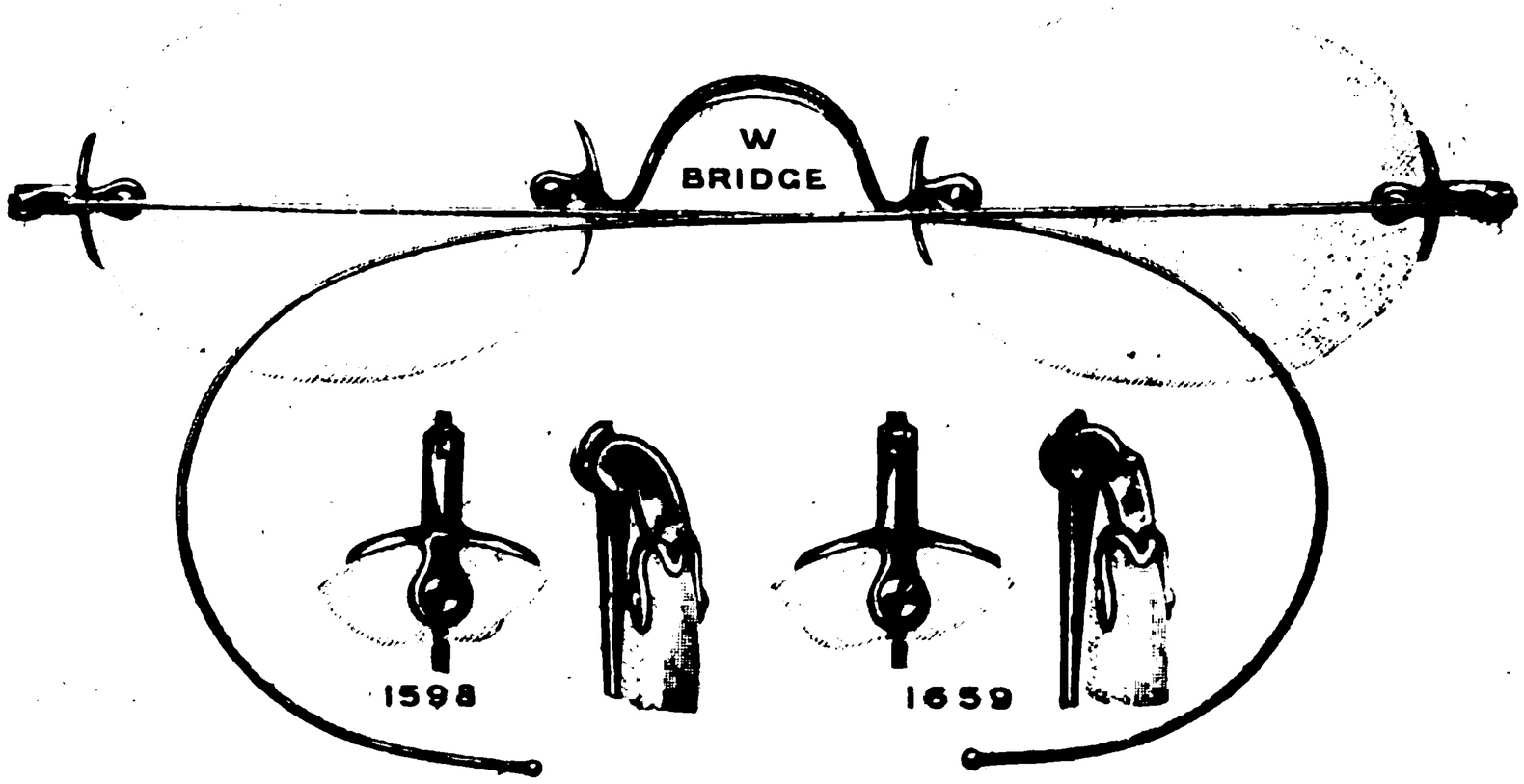
QUALITY FIRST

DUPAUL, YOUNG OPTICAL CO.,

ESTABLISHED 1888.

SOUTHBRIDGE, MASS., U.S.A.

Manufacture only Guaranteed Quality and Best Finish Gold-Filled and White Metal Spectacles, Eyeglass Frames, Astigs, Mountings and Materials.



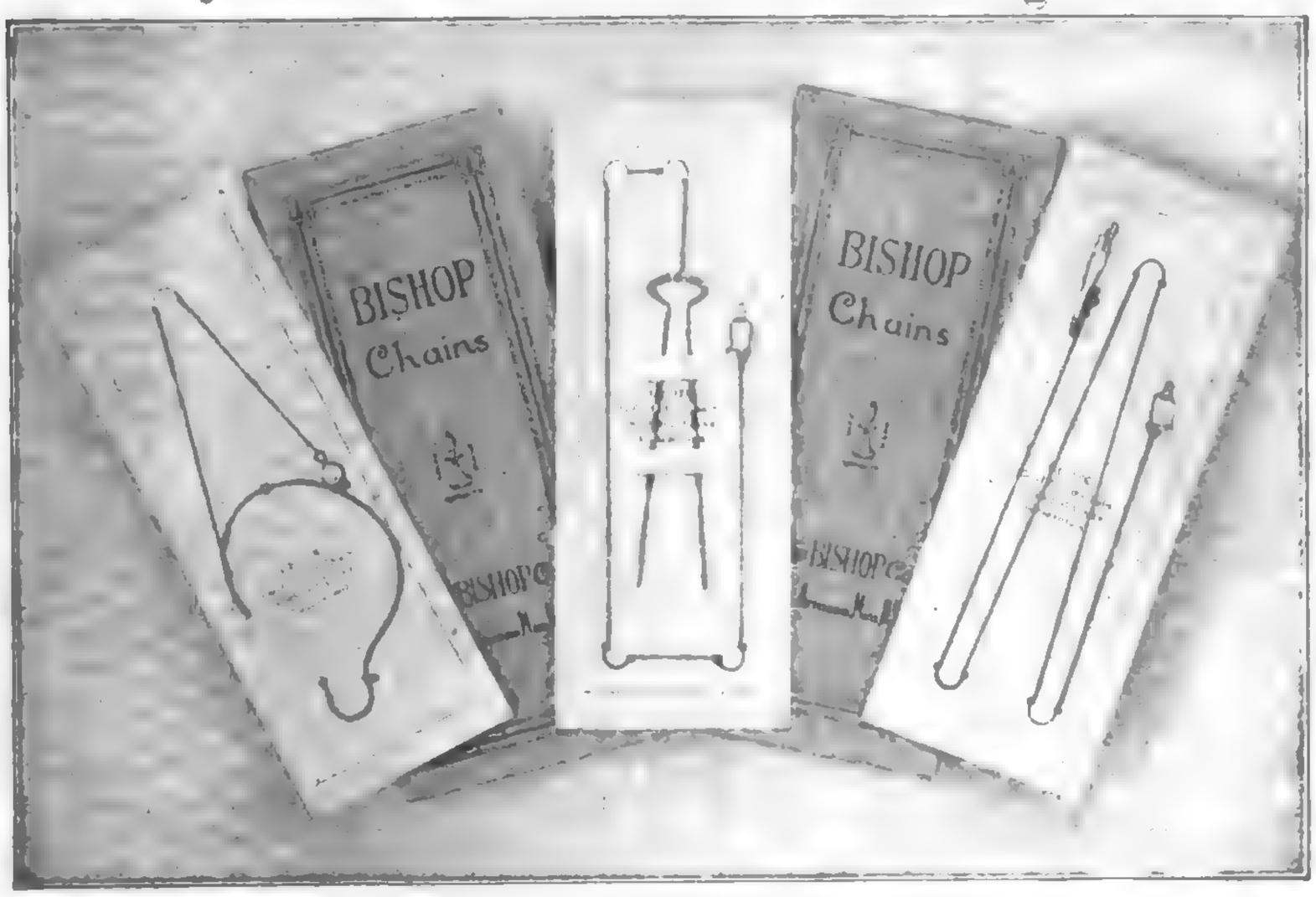
To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY





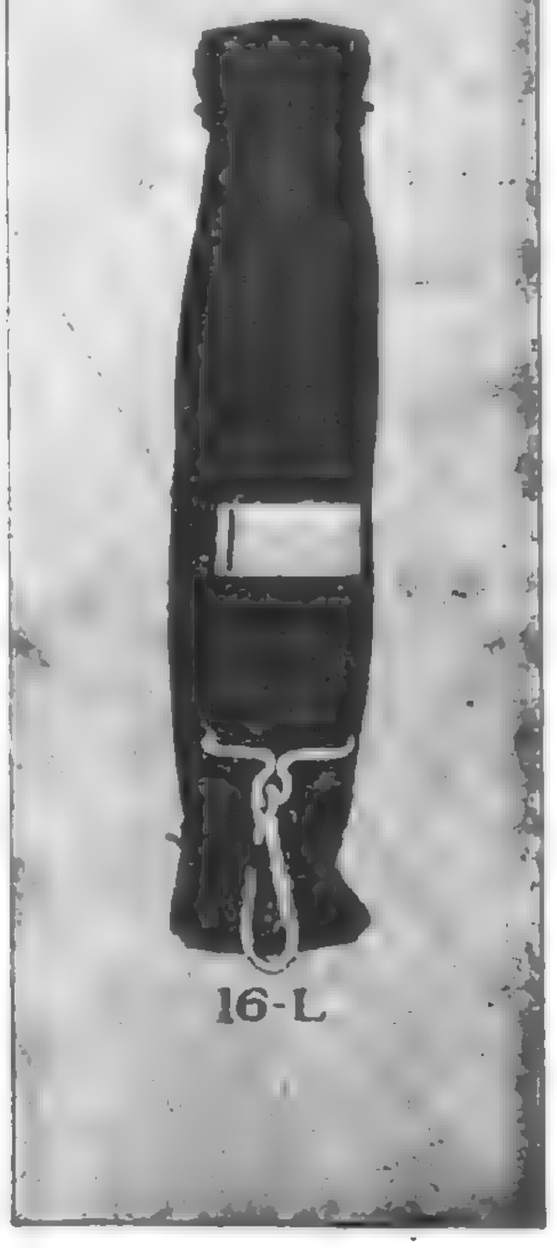
BISHOP CHAINS

should be your standard of Quality,
in solid Gold and Gold Filled,

BISHOP SILK EYEGLASS CORDS AND MONOCLE RIBBONS.

With Gold Filled, Silver or Gun Metal snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.

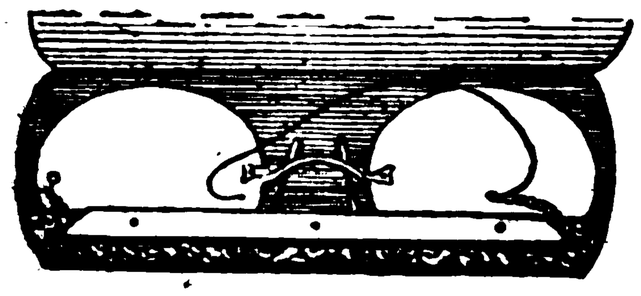


To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. Telephone: CENTRAL 7241.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



THE "GRAYWIN" CHAIN HOLDER.

"NO MORE TANGLED CHAINS"

This useful attachment prevents chains from getting entangled in F.P. and other mounts whilst in the case. Easily attached to any Spring Lid Case. A profitable side line. Quantities and further particulars from the Patentees

Messrs. GRAY & WINZAR,
14, Cornwallis Gardens, Hastings.

REPRESENTATIVES WANTED.

RADIUM COMPOUND

SELF-LUMINOUS.

Highest Possible Efficiency, Durability and Value.

As supplied to H.M. Government, &c.
Guaranteed to pass N.P.L. requirements.
All Grades in stock, from 15/- per gram.
RADIUM SALTS TESTED AND CERTIFIED.

F. HARRISON GLEW THE RADIUM LABORATORY,

156, Clapham Road, London, S.W.9

NORTHAMPTON POLYTECHNIC INSTITUTE.

CLERKENWELL, LONDON, E.C.1

Principal—R. MULLINEUX WALMSLEY, D.Sc., F.R.S.E.

DEPARTMENT OF
OPTICAL ENGINEERING AND APPLIED OPTICS.

Six lectures, introductory to the ordinary courses of the department, will be held in the Institute on Wednesday evenings during the Autumn. The lectures will be illustrated extensively by experiments and will be so arranged as to leave time for questions and discussion at the end of each lecture.

Below are particulars of the Subjects to be dealt with and the dates of the lectures.

Wednesdays, October 26th, and November 2nd at 7.15 p.m., two lectures on

"The Eye and Man's Work in Assisting It."
By PROFESSOR F. J. CHESHIRE, C.B.E., A.R.C.Sc., F.Inst.P.

Wednesday, November 9th, at 7.15 p.m., on

"The Human Eye, a Living Organ."
By C. L. REDDING, F.S.M.C.

Wednesday, November 16th, at 7.15 p.m., on

"Some Optical Munitions of War."
By H. H. EMSLEY, B.Sc.

Wednesday, November 23rd, at 7.15 p.m., on

"Some Applications of Optics to Engineering."
By H. H. EMSLEY, B.Sc.

Wednesday, November 30th, at 7.15 p.m., on

"Polarised Light and Polarisation Apparatus."
By PROFESSOR F. J. CHESHIRE, C.B.E., A.R.C., Sc., F.Inst.P.

Admission by ticket, to be obtained at the Institute on the evenings of the Lectures.

For the course of Six lectures, 2/6; for any Single lecture, 9d.

Scientific Instrument Makers.

MICROSCOPES of all kinds manufactured at our own works.
REPAIRS to Prismatic and other Binoculars etc., promptly executed.

H. H. SHARLAND (H. KEMP), 9 & 10, THAVIES' INN, HOLBORN CIRCUS, LONDON, E.C. Tel.: Holborn 4840. Established 1864.

Every Description of Ophthalmic Supplies.
All Requirements of the up-to-date Sight Testing Optician.
Good Special Lines at keenly Competitive Prices.

The Optician's Handbook.

Price 4s. 0d. Post Free.

An elementary text book required by every student of Optics.

It is an introduction to "The Study of the Refraction of the Eye, its Anomalies and their Estimation and Correction by means of Glasses.

The Hatton Press, Ltd.,
125, Fleet Street, LONDON, E.C.4

VISUAL OPTICS & SIGHT-TESTING

By LIONEL LAURANCE.

A New Edition, just out. Price 21s. 21s. 9d. post free.

GENERAL AND PRACTICAL OPTICS

By LIONEL LAURANCE.

A New Edition. Price 21s. 21s. 9d. post free.

The two ideal books for the acquirement of a knowledge of the subjects indicated by their titles.

THE HATTON PRESS, Ltd.,
125, Fleet Street, London, E.C.4

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

spectacle vendors, for you have considerable knowledge of the optical principles on which refraction testing should be based, and in addition, you can use the shadow test and the direct method of examination, which they could not. You seem to me to be quite competent to test most cases of ordinary errors of refraction, and I feel quite certain that the legislature will never step in and try to prevent you endeavouring to fit with a pair of "specs." a client whose sight is failing.

Complications in Refractive Error.

There are two dangers which must be mentioned. In the first place the man who finds his sight failing may have in reality an error of refraction, but that may not be the whole story. In addition he may have one of a large variety of eye diseases, and these disorders of the eye (very important in themselves) may, and very often do, indicate that there is something organically wrong, not only with his sight, but with his whole being. The second danger arises from the fact that mydriatics are required in the testing of all young persons, and without their use I do not think that even an approximately accurate refraction diagnosis is likely to be obtained below the age of thirty or even of thirty-five.

Mydriatics are by no means very safe remedies to handle, and I for one would entirely deprecate their promiscuous use by anyone who is not a trained ophthalmic surgeon. It is for these reasons that I have always opposed the teaching of refraction testing in the Royal Technical College. It is impossible to teach refraction without the presence of large numbers of patients; without that it is as impossible to give any instruction worthy of the name on this important subject, as it is to teach equitation without horses. Nothing could be more dangerous than to have large numbers of patients attending a clinique for any part of ophthalmic practice, which clinique is not under the control of some one, who is both a qualified medical man and a thoroughly trained ophthalmic surgeon.

Having discussed these preliminary matters in some detail, I now turn to the subject on which I have been specially asked to speak, viz.: Diplopia. I have some reluctance in complying with the request, and that for two reasons. In the first place, it is a huge subject; for a full discussion of diplopia would also entail an adequate exposition of the closely allied conditions of squint, and of the various forms of muscular imbalance. Nor would any explanation of these conditions, however detailed, be of any avail without adequate clinical practice.

Such a subject cannot be learned from text books or from lectures, or even from demonstrations. He who would really know about such matters must personally examine a large number of patients. You will never learn to use an ophthalmoscope by hearing the instrument described, nor by looking at pictures of the fundus. The only way to acquire a knowledge of the instrument and what it shows, is by constant practice. Most of you have read, or can read, something of the subject of diplopia, for it is abundantly dealt with in most text books of ophthalmology to which you have access, and with which many of you are familiar.

From another point of view, I have felt reluctance in speaking on this subject to this audience. When a patient has diplopia there is always something seriously wrong. A patient who has diplopia, most frequently has paralysis of one or more of the external muscles of one or both eyes. In a few cases, a diplopia is due to the growth of an orbital tumour. Both of these conditions are of primary importance, and urgently require highly skilled diagnosis and treatment. No doubt in a few cases at certain stages optical treatment, as by prisms or decentered lenses, may give great relief; but it would be malpractice in the highest degree to fix attention on a very subsidiary matter of that kind, and to leave out of account those serious conditions which are the cause of the diplopia, and which may ultimately cost the patient his or her life. To some extent I am glad that the subject of diplopia has been suggested, for it has afforded me this opportunity of giving the above clear warning. There is no secret, however, in the matter; anybody can get ample information on diplopia in any good modern text book of ophthalmology.

Diplopia.

I have, however, ventured to think—probably I am wrong—that the method which I used for many years in teaching students the facts of diplopia is much more simple than the ordinary methods of the text books. By diplopia is meant—as the name implies—double vision. A patient looks at an object with which he is familiar, and instead of seeing it singly he sees two similar objects, which as a rule are quite distinct, the one from the other; although under certain conditions they may more or less overlap each other. I am going to deal only with those cases where the two objects do not overlap, but are distinct and clearly seen.

At this point it is necessary to define what is meant by the true image and the false

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

image. From that remark it is obvious that I am dealing only with the most common form of the condition, namely, that in which only one eye is affected by such an occurrence as paralysis or orbital tumour. When the patient is requested to look at a definite test object, such as a lighted candle, the image of the object which is seen by the unaffected eye is formed on the macula; hence with that eye the patient sees the object in its proper position in space. In other words, the projection is normal. The duplicate object, however, does not appear in its real position, but at another point in space. A simple diagram will, I venture to think, make the matter perfectly clear.

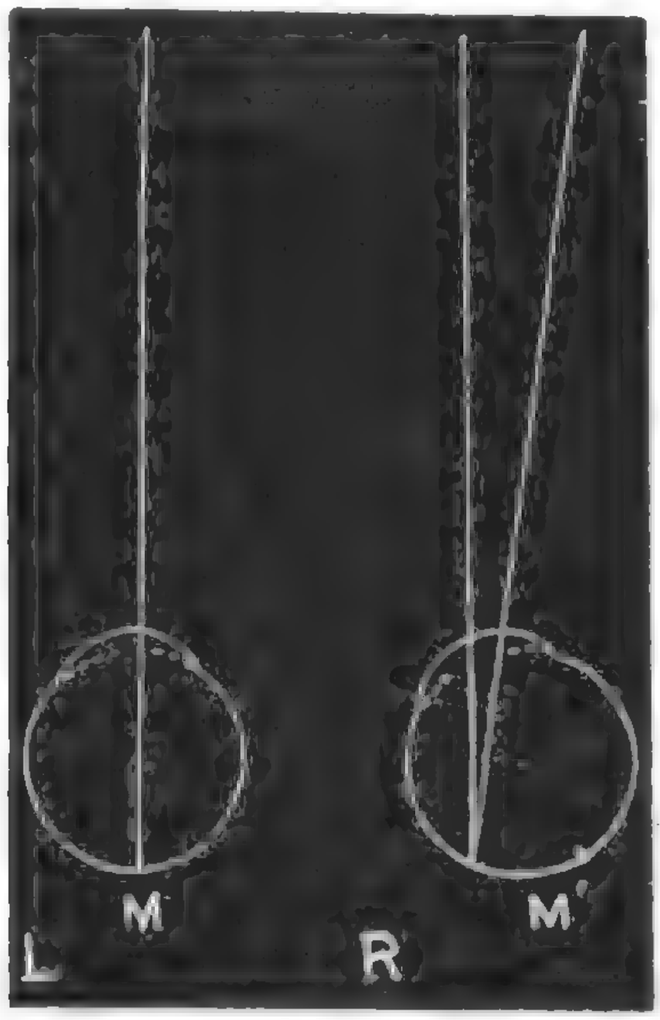


DIAGRAM I.

Right and left eyes as seen from above; right eye convergent. M, the macula of the left eye, and M/ that of the right. The fixation is supposed to be on a distant object. In the case of the left eye, the image is formed on the macula; hence it is projected to its true position in space. The image of the right eye is formed to the inner side of the macula; therefore, it is mentally projected considerably to the right of its true position.

In testing a patient it is necessary to distinguish between the true and the false images. As most of you know that is very easily done by a method which has been in popular use for many a long year. A trial frame is put on the face of the person being examined, and in one cell a disc of red glass is inserted, and in the other a disc of green or blue glass. For the remainder of this paper, it is to be understood that the red glass is inserted in front of the left eye, and the green in front of the right. The test object is usually a lighted candle held in the hand of the examiner.

Here, however, I must make another digression for I wish to show how diplopias may most easily be recorded in terms of rectangular co-ordinates, and, therefore, it is necessary to explain what is meant by these co-ordinates although I am well persuaded that only a few of the members of this audience need any such explanations.

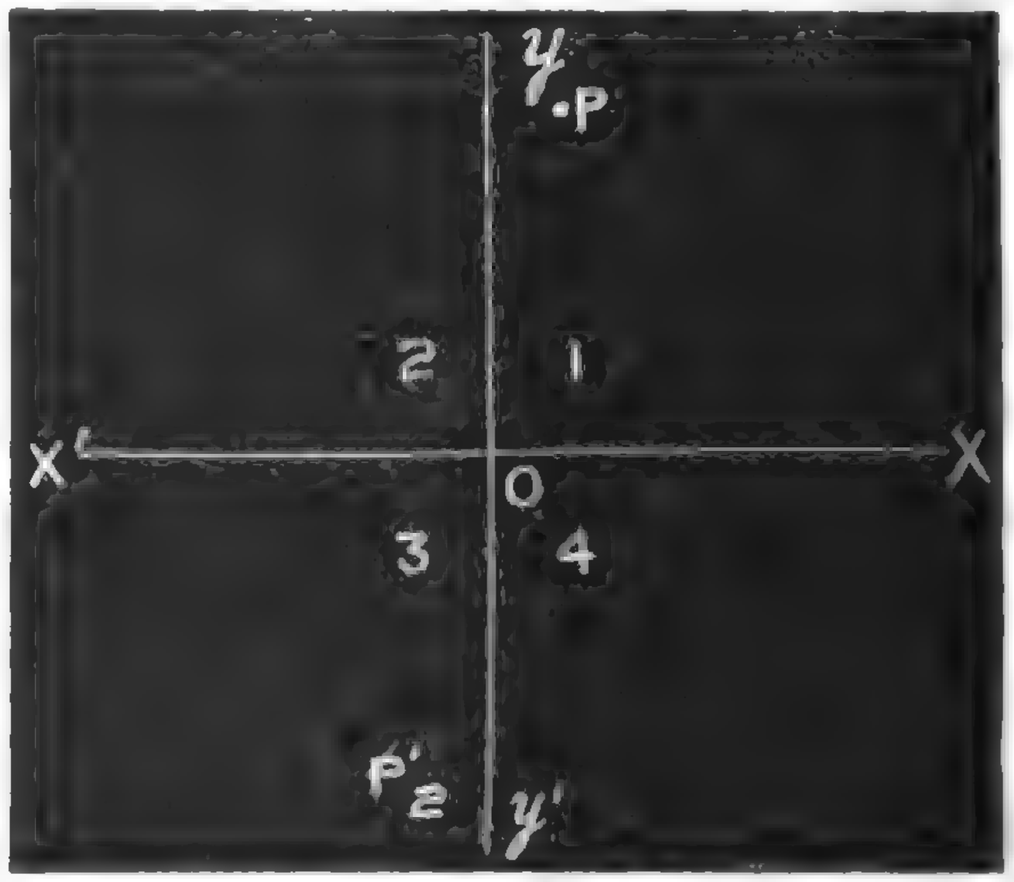


DIAGRAM II.

Let a vertical right line be drawn on a blackboard or screen, and also a horizontal one (as in diagram II.), and let the vertical one be designated Y Y/ and the horizontal X X/, and let them intersect at the point O. These two right lines are called rectangular co-ordinate axes. The point of intersection is called the origin, and the line X X/ is called the abscissa or X axis, and the line Y Y/ is called the ordinate or Y axis. The lighted candle is placed in front of the point O, and as close to it as can conveniently be arranged.

Let us suppose that the case with which we are dealing, is one in which the right eye is the affected one, and the left as regards fixation is normal. Under these circumstances the patient will see a red candle at the origin, for the left—the unaffected eye—has in front of it the red glass. At the same time the patient is aware of a second image—green—which is not at the origin, but is projected to some other point. In other words, the second image is displaced.

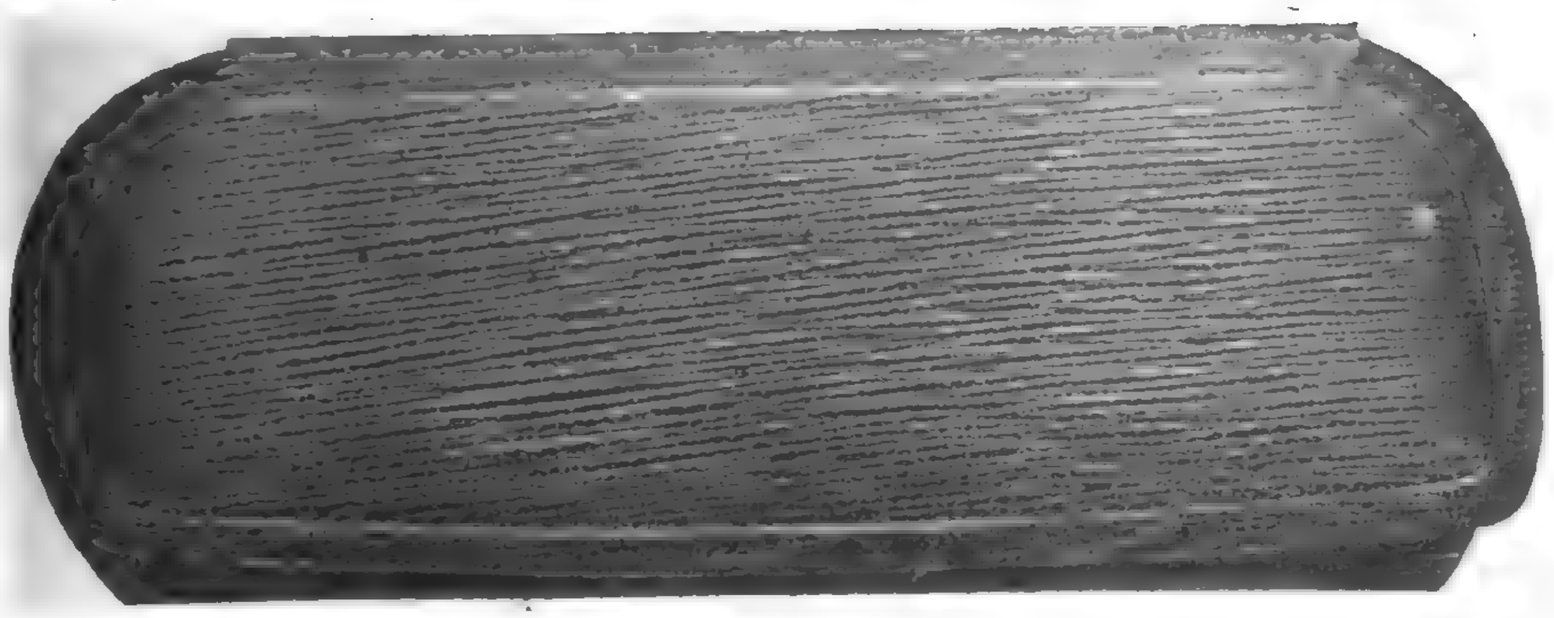
Now this displacement may be one of two kinds. In the first place the displacement may be only lateral, *i.e.*, the true and the false image are on the same level or approximately so. When this is so, then if the true image —the red—is at the point O, the false one is approximately or exactly, on the X X/ axis, but either to the left or to the right of O. As

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

"WERTEX"

WILLMOTTS'

LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.



11c 11c

Having corrected a client's sight and supplied glasses, present them in a case *worth looking at.*

Use "WERTEX" Cases.

All particulars may be had from your dealer or direct from the manufacturers.

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

ENGLAND.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

A FEW INTERESTING REMARKS REGARDING

RX WORK

1918 ←——— 1921

April 1921.

"Your work, I must say, has given every satisfaction, both as regards quality and despatch, as I have mentioned more than once I believe."

April 1921.

"I am very pleased with the three jobs received this morning, they appear to be very well done."

April 1921.

"Many thanks for the work received this morning which was quite satisfactory."

March 1921.

"Thank you very much for the jobs received so promptly this morning."

March 1921.

"Very many thanks for such prompt delivery."

February 1921.

"I am very pleased with the way you have executed these Toric lenses, it is one of the best jobs I have seen."

December 1920.

"We are in receipt of the spectacles despatched by you yesterday, and wish to thank you for the quick despatch, and also for the quality of the work, which is excellent. It is a pleasure to deal with a firm such as yours, our only regret being that we did not send our previous prescriptions to you."

December 1920.

"I have been very much impressed by your promptness, accuracy and courtesy at all times, and am greatly obliged to you for the attention you give to my small orders."

December 1920.

"We have recommended your firm to three other Opticians, and trust you will receive their work, as we are perfectly satisfied ourselves."

October 1920.

"Congrats. on excellent job you turned out this week for Toric Panto Rimless Spect. It was real high-class workmanship."

August 1920.

"Thanks very much for prompt return of Rx and Repair work."

May 1920.

"Thank you so much for having the prism job done so quickly."

December 1919.

"I have been very pleased with the way you have dealt with my orders, and thank you for your promptitude in these difficult times."

June 1919.

"I have advised Mr....., D.B.O.A., to send his best work to you together with two or three trade references. He has six shops or more. Trusting you will be able to do it for him."

June 1919.

"I would like to take this opportunity while writing you, of mentioning that I am very satisfied indeed with your jobbing as a whole."

June 1919.

Again I wish to thank you for Rx service which you have done for me."

April 1919.

"Thanks very much for doing job No. 93. Lenticular lenses so quickly, they are very nicely done and our customer is very pleased with them."

December 1918.

"Am very pleased with the way you are getting my work through."

KIRK BROTHERS

WHOLESALE MANUFACTURING OPTICIANS

36, Gray's Inn Road, LONDON, W.C. 1

IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY.

South Kensington, S.W.7.

Department of Optical Engineering and Applied Optics.

Lecture Courses will be given during the Autumn Session, 1921, on

General and Advanced Optics; and Polarised Light, by Professor Cheshire.

Elementary and Advanced Optical Designing and Computing; and Workshop and Testing Room Methods, by Professor Conrady.

Advanced Optics; and Construction Theory and Use of Optical Measuring Instruments, by Mr. L. C. Martin.

Due notice will be given of certain special courses, including one by Professor Fowler, F.R.S., on Spectroscopy.

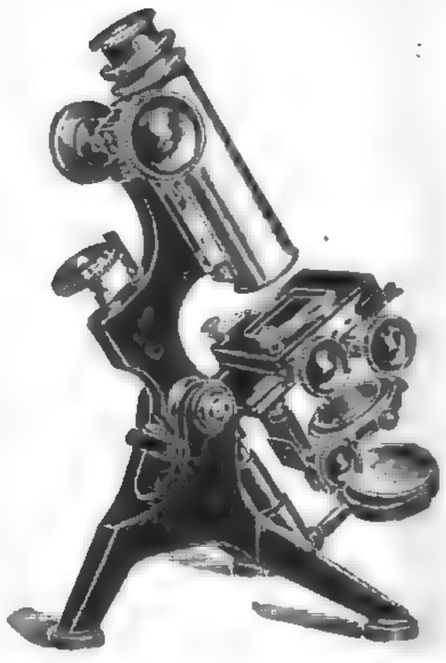
For further particulars and for admission tickets apply to Registrar at the above address.

The Director is open to receive applications from students and others desirous of carrying out research work in the Laboratories.

SELL WATSONS' BRITISH-MADE

MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,

313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1857

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

the green glass is before the right eye, if the false—green—image appears to the right of the red, we say that the case is one of homonymous diplopia. If on the contrary, the green image belonging to the right eye, appears to be to the left of the red image, we say that the patient is suffering from heteronymous or crossed diplopia.

Horizontal Diplopia.

The rule for horizontal diplopia is easily remembered, viz.:—when the axes of vision intersect, the diplopia is homonymous; and when the axes of vision diverge, the images are crossed.

Let us now again briefly refer to the case with which we are dealing, namely, a sound left eye and an affected right. If on examination it is found that the green image is on the same level as the red, and that it is situated to the right of the red, we at once conclude that the visual axis of the right eye is converging too much. We conclude from this observation that there is a defect in the diverging power of the affected eye. What is the chief muscle that controls the divergence of the right eye? Undoubtedly its external rectus. We, therefore, conclude that here we are almost certainly dealing with a paralysis of the external rectus of the right eye. Such a patient urgently requires the attention of a physician, or of a neurologist, and may possibly ultimately have to pass into the hands of the surgeon.

Under circumstances similar to those above mentioned, had the diplopia been of the crossed variety, and the displacement purely a lateral one, the inference would undoubtedly have been that the patient was suffering from an affection of the internal rectus muscle.

So far we have discussed those cases of diplopia in which there is only a lateral component. The displacement is along the X X′ axis, and there is no displacement in the direction of the Y Y′ axis. Till now we have only discussed those forms of the malady in which there is no vertical component.

In the second group are included all the diplopias in which there is a vertical as well as a horizontal component. The vertical component, as a rule, is much the larger of the two. The true image is, as before, at the origin, and the false image is on a higher or on a lower level than the true one, but is never, or almost never, exactly above or below it. There is in addition to the marked vertical displacement, almost always a perceptible horizontal displacement.

On referring to diagram II. it will be seen that the intersection of the X axis with the Y axis delimits four quadrants which are numbered 1, 2, 3, and 4, respectively. Further it is to be observed that all distances measured along the X X′ axis from O to X are positive, and that all distances measured in the direction O X′ are negative. Similarly all distances measured along O Y are positive, and all distances measured along O·Y′ are negative. If now the false image is projected by the right eye to the point P, and if a perpendicular drawn from this point to the line O X, intersects it at 5 centimeters from O, and another perpendicular drawn to the line O Y, intersects it at 30 cent meters from O, then the co-ordinates x y of the point P are 5 and 30. In this case, according to the convention just stated, both of these values are positive. If on the other hand, the false image were projected to the point P_2 in the third quadrant and on drawing a perpendicular from P_2 to O X′ we again found it intersect at 5 centimeters to the left of O, and in drawing another perpendicular to O Y′ we similarly found it to intersect O Y′ at 30 centimeters below O then we have the same numerical values, viz: 5 and 30, but both these values are here negative. The co-ordinates are, therefore $(-x-y)=(-5-30)$. In the second quadrant all values of X are negative, and all values of Y are positive, whi'e in the fourth quadrant all values of X are positive, and all values of Y are negative.

If in making these measurements from time to time the patient is kept at a constant distance from the screen, then it can be ascertained at suitable intervals whether the displacement is decreasing or increasing; in other words whether the condition is improving or getting worse.

Further, the patient's head should be held erect by the use of a chin rest or other suitable apparatus.

Vertical diplopias, generally speaking, may be divided into two sections. The first includes those cases in which the diplopia is chiefly in the upper part of the field of binocular fixation. In the second are placed all the diplopias which occur chiefly in the lower half of the field of fixation.

General Remarks.

One or two general remarks here may be made. In a vertical diplopia which is most marked in the upper half of the field of fixation, the upper of the two images is the one which belongs to the affected eye; while conversely in a diplopia which is most marked in the lower part of the field of fixation, the lower of the two images belongs to the affected eye.

A reference to diagram III. affords a simple explanation of this fact. A and B are two eyes on the same level for distant fixation. Owing to paralysis, or some other cause, the patient is unable to rotate the eye A, freely upwards. Let it be granted that in the horizontal position, the image of a candle held at H, is formed on the macula of each eye, then

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

there is binocular fixation. If now the candle is raised to the position H_2,

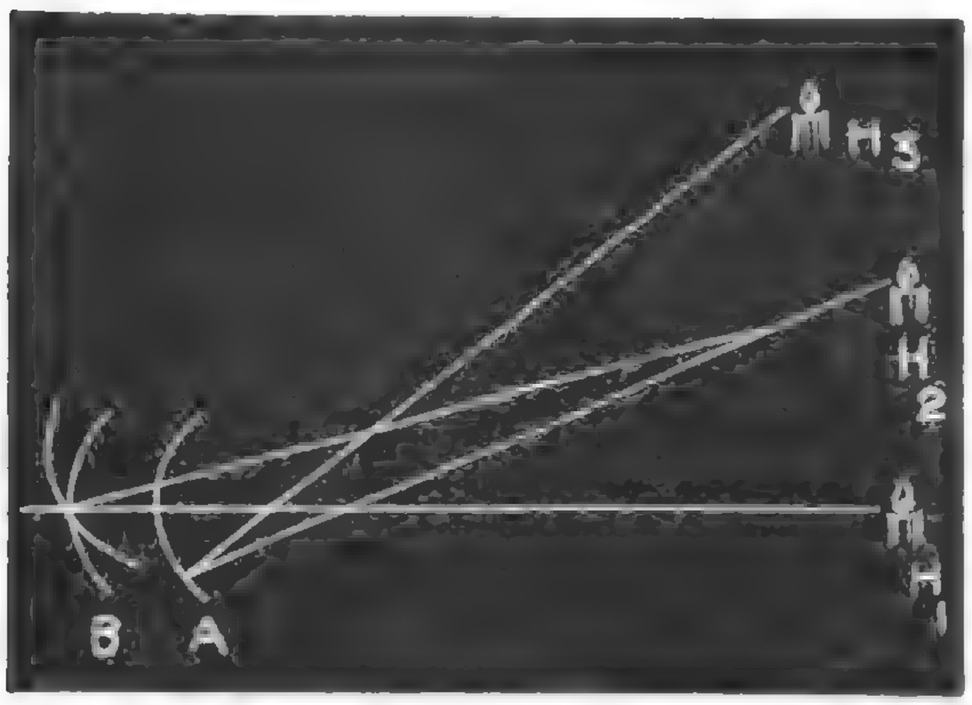


DIAGRAM III.

the eye B makes the movement of rotation necessary to keep the image on its macula, the eye A, according to the above supposition cannot make the necessary rotation, so the image comes to be formed on that point of the retina of A which has its projection at H_3. The higher the candle is raised the higher the false image appears to be.

As already indicated, all but invariably there is a horizontal as well as a vertical component; the two images are almost never so placed that the one is exactly above the other.

The discussion of a few cases will at once clear this subject of any difficulty. Let us take as a first example a vertical diplopia chiefly manifest in the upper part of the field of fixation. The candle should at the beginning of the investigation be held in the same horizontal plane as the patient's eyes, and at a convenient distance from the patient. Even at that height the diplopia may be perceptible. The apparent vertical distance between the true and the false images increases as the candle is moved upwards. Let us suppose that the green glass is in front of the right eye, and the red in front of the left; then, in this particular case, if the red is the higher of the two, it is obvious from what has just been said, that the left is the eye affected. From this is must be concluded that there is something interfering with the upward rotation of the left eye.

Now this defect may be due to several causes, such as orbital tumour, and even frontal sinus disease, but by far the most frequent cause, and the only one which we shall discuss in this communication is defective action of one or other of the two muscles which rotate the anterior surface of the eyeball upwards. What are these muscles, and what is the action of each? The superior rectus rotates the anterior surface of the eyeball upwards and at the same time rotates the superior half of the vertical meridian of the cornea inwards. If the superior rectus is defective in action, then there is deficiency of the upward rotation, and also of the inward rotation. The latter gives rise to a relative, or even absolute divergence.

In other words, the visual axes have either a relative or absolute divergence. Hence we will get a diplopia, the chief component of which is vertical, and the subsidiary component, on account of the divergence, is crossed. If in such a case we find that the red image is the higher of the two, we know at once that the left eye is the one affected; further, if the red image is situated not immediately above the green, but a little to the right of it, we know, because the secondary component is crossed, that the muscle involved is the superior rectus of the left eye. Conversely, had the green been the higher of the two, and had it appeared not directly above the red, but a little to the left, we would have at once concluded that the right superior rectus was the muscle affected.

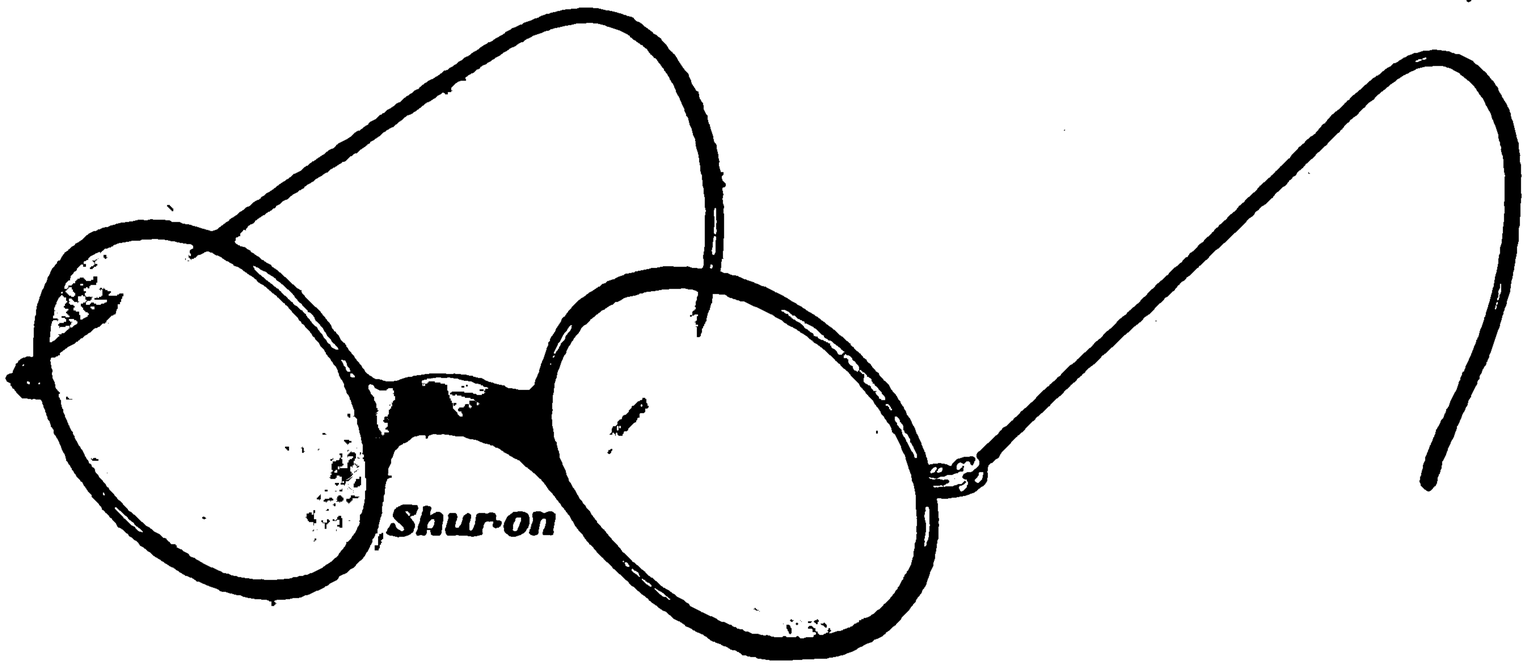
The other muscle which moves an eyeball upwards is the inferior oblique. Its insertion however is towards the posterior aspect of the ball. Hence its action not only moves the eyeball upwards, but in health it tends to rotate the superior meridian of the cornea outwards, and to cause divergence of the visual axis. Paralysis of this diverging muscle will cause a certain element of either relative or absolute convergence; therefore, the secondary component of the diplopia is homonymous for as already explained, when the axes of vision intersect, the diplopia is homonymous. If, therefore, the green light in such a case is higher than the red, and if it is a little to the right of the red, we at once conclude that the inferior oblique of the right eye is the muscle affected.

Conclusion.

In finishing this short study it only remains to say a few words about the vertical diplopias which are chiefly marked in the lower half of the field of binocular fixation. Here the lower of the two images belongs to the affected eye. If the secondary deviation gives a crossed diplopia, then it is the inferior rectus that is affected, for the inferior rectus has a secondary action of convergence, and its paralysis gives a relative or absolute divergence. Conversely, if the secondary component be homonymous we know that it is the superior oblique of the affected eye which is at fault.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Shur-on Glasses



Here's a Ready Seller.

A NEW SHELLTEX SHUR-ON—Lightweight! Smart, distinctive, practical. Just what you've wanted for the small, hard-to-fit features. It's as becoming as it is practical, as dependable as it is "Quality Beyond Question." Has a solid, lightweight, Shelltex front—a beautiful cherry, a regular Shur-on End Piece and a +5 Temple, metal lined, all expertly fashioned and finished. In all the wanted P. D.'s and bridge measurements. Stock this popular Shur-on.

If your wholesaler cannot supply you, send us his name.

Shur-on Optical Co.,
Rochester, N.Y. U.S.A.

Quality Beyond Question Since 1864

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

For Readers Abroad.

In order to direct more pointedly the attention of buyers to whom THE OPTICIAN is sent in France, Spain, Russia, Italy, China and Japan, to the important matter of correspondence with our advertisers, we print herewith an announcement of which the English translation is given immediately below:

Any advertiser in this paper will be glad to hear from you, and to learn your requirements. He will quote prices and help you all he can.

Toutes les Maisons faisant de la publicité dans ce Journal seront heureuses de recevoir vos demandes et de connaitre vos besoins. Elles vous donneront des prix et vous aideront de tout leur pouvoir.

Todo avisador de este periodico tendra mucho gusto de comunicarse con Ud. y de atender sus pedidos. Cotizará precios y ayudará á Ud. en todo lo que se pueda.

Благоволите обратиться къ фирмамъ, помѣстившимъ свои объявленія въ этой газетѣ, съ Вашими почтенными запросами, съ изложеніемъ подробностей относительно Вашихъ требованій, по полученіи каковыхъ онѣ сообщатъ Вамъ цѣны и окажутъ Вамъ всякое, по возможности, содѣйствіе.

Tutti coloro che fanno annunzii in questo giorrale saranno lieti di conoscere le vostre richieste. Essi vi faranno offerta de prezzi e vi favoriranno quanto piú possibile.

購 書 目 願 交 與 之 知 者 登 本
力 呈 將 接 所 貴 告 報
相 示 價 並 君 需 君 願 白 之
本紙上掲載ノ
廣告者ハ皆彦
ノ御願合ヲ歓
迎レ且御希望
ニ應ズル、事
栄ヲ得度候
廣告者ハ価格
ヲ始強レ又出
来得ル限リ
御希望ニ相叶
フ様努力可仕
候

TO THE READER AT HOME or ABROAD

who receives this copy of THE OPTICIAN

— and is not yet a subscriber, we say —

You cannot do without THE OPTICIAN

Digitized by Google

NOTICE.

This is to remind you that we shall be issuing our

AUTUMN SPECIAL NUMBER, as usual, (Oct. 28), and we should be pleased if you would send your copy as soon as convenient.

Worshipful Company of Spectaclemakers.

Tuition for the Company's Examinations in Optics and Sight Testing at

THE SCHOOL OF OPTICS Ltd.

2, GUILFORD PLACE, LONDON, W.C. 1

Particulars on application.

BRITISH OPTICAL INSTITUTE, LTD.,

(College of Optics).

Complete Training for the Sight-Testing Optician.

In addition to the usual Daily Classes and Correspondence Courses, there will commence shortly a series of Special Evening Classes, for those desirous of preparing themselves for any of the Optical Examinations.

A further series of Weekly Evening Lectures, and Demonstrations, for candidates for the F.B.O.A. Examination, and for post-graduates, has also been arranged.

Vacation Classes.

From July to October a series of Vacation Classes will be held for those who wish to widen their knowledge—not necessarily with a view to sitting for any examination.

The whole work of the Institute is carried out under the supervision of the Principal, assisted by Mr. G. W. Colebrook, F.B.O.A., F.S.M.C., (Master's Prizeman).

For full particulars apply to:—The Principal, Dr. MAX COGUE, B.Sc., Fern Lodge, 20a, Grove Road, Brixton, S.W.9

Telephone: Brixton 677.

Original from THE OHIO STATE UNIVERSITY

In the few cases of vertical diplopia in which one image is directly above the other, we, generally speaking, are dealing with a patient in whom the insertions of the obliques have been slightly abnormal. Their insertion is not so posterior as is usually the case, and hence in health they have not exercised any appreciable diverging power. Consequently the paralysis of such an oblique muscle does not lead to any relative or absolute convergence.

In operating on eye muscles I have again and again, after section of the internal rectus, found the eye still to retain a fair amount of converging power. That is due to the simultaneous and equal action of the superior and inferior recti. Similarly after section of the external rectus, I have always, when I have examined for it, found that the eye possessed a fair amount of power of external rotation, which is due to the superior and inferior oblique muscles.

STAR-DISCS.

A paper on star discs (A. Buxton M.A.) has recently appeared in the Monthly Notices R.A. S. as a continuation of the work commenced by Prof. A. E. Conrady (Monthly Notices R.A.S. June, 1919).

Owing to diffraction effects, the image of a star in a telescope consists of a strong central concentration of light, surrounded by rings of rapidly diminishing intensity. The central intensities and the intensities in the outer rings have been determined,

(1) for a perfect instrument. (Airy's problem, Camb., Phil., Trans., 1838).

(2) when the image is out of focus by varying mounts.

(3) when simple spherical aberration is present in the lens system.

(4) when out of focus conditions are combined with the presence of spherical aberration.

The intensities, in all cases, are determined mathematically, taking the central intensity in case (1) as the standard and equal to unity. The resultant intensity due to a thin circular strip of light at a point in the diffraction-pattern is treated first and found to be proportional to $J_0\left(\frac{ry_1}{f}\right)$ where r is the radius of the strip y_1 is radius of the diffraction pattern, and f is the focal length. The intensity for the circular strip is next integrated over the whole aperture of unit radius and found to be very nearly proportional to $\frac{2f}{y_1} J_1\left(\frac{y_1}{f}\right)$ so that the intensities for (1) are now calculated for any points in the diffraction patterns.

In case (2) the intensities are calculated from the formula

$$\text{Intensity} = \left[\int_0^1 J_0\left(\frac{ry_1}{f}\right)\cos c_1 r^2\, dr^2\right]^2 + \left[\int_0^1 J_0\left(\frac{ry_1}{f}\right)\sin c_1 r^2\, dr^2\right]^2$$

where c_1 is a constant depending on the amount out of focus. The numerical values of the intensities are given for $c_1 = \frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1, 1\frac{1}{2}, 2, 4$ wave-lengths respectively, with the corresponding linear shifts of the focus along the optical axis.

In case (3), the intensities are obtained from the same formula except instead of $\cos c_1 r^2$ and $\sin c_1 r^2$ the terms $\cos c_2 r^4$ and $\sin c_2 r^4$ occur, since simple spherical aberration varies as the fourth power of the aperture.

For the most important case (4), the following formula was used:

$$\text{Intensity} = \left[\int_0^1 J_0\left(\frac{ry_1}{f}\right)\cos\left(c_1 r^2 + c_2 r^4\right) dr^2\right]^2 + \left[\int_0^1 J_0\left(\frac{ry_1}{f}\right)\sin\left(c_1 r^2 + c_2 r^4\right) dr^2\right]^2$$

for different combinations of amounts out of focus (c_1) and amounts of spherical aberration (c_2).

Each focus considered is defined by its position with respect to the marginal and paraxial foci of the system. It is shown that with c_2 wave-lengths of spherical aberration the equation of the marginal focus is $c_2 r^4 - 2c_2 r^2$. The focus which gave the highest intensities under these conditions was easily seen to lie halfway between marginal and paraxial foci and not as geometrical optics would suggest $\frac{3}{4}$ of the distance between these two foci. Further, the intensities for a $\frac{1}{4}$ wave length out of focus balanced by $\frac{1}{4}$ wave length spherical aberration are practically as high as

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

those for the ideal Airy spurious discs in case (1) and much higher than either $\frac{1}{4}$ wave length out of focus in case (2) or $\frac{1}{4}$ wave length spherical aberration in case (3). In fact, even a whole wave-length of spherical aberration may be tolerated without undue deterioration of the image, provided it is balanced by a wave-length out of focus. Thus it appears that the resolution can be increased by retaining Lord Rayleigh's classical residual of spherical aberration. The intensities for foci at equal distances from and on either side of the best focus are shown numerically in tables and also graphically at the end of the paper. New formulæ for the central intensity at any focus along the optical axis under conditions of cases (1), (2), (3), and (4) are given, thus providing a ready guide to the values of the intensities in the corresponding diffraction patterns. A. B.

Visual Disturbance by Wood Alcohol.

Rostedt states that since 1917 there has been a rapid increase in the number of cases of wood alcohol poisoning in Finland. The cause of this increase is clearly the attempt which began at that period to make that country "bone dry." Grain alcohol has been replaced industrially by denatured spirits which contain from 2 to 3 per cent. of crude wood alcohol. The number of victims to date is 60, of whom half have been blinded. The amount of spirits actually ingested is difficult to determine, and but 8 patients of the 60 could give exact information on this point. The amount of denatured spirits drunk varied from 100 to 400 gms., which represented from 2.5 to 10 c.c. of methyl alcohol. Usually the dose taken was set down as about half a pint, which would represent 7.5 c.c., and this may be taken as the amount sufficient to blind.

In most cases the visual disturbances appeared in the course of the third day of the intoxication. The course of these disturbances is very rapid and in from one to three days the acute stage is over. Following, there may be slight improvement, which, however, is not permanent. The peripheral portion of the visual field is seldom altered at the outset. There is a central scotoma which varies in size and degree. With the ensuing atrophy of the optic nerve the visual field contracts concentrically from the periphery and there are disturbances of colour vision. The eyegrounds appear normal at first, but in the course of several weeks the papilla is quite paled out and may be excavated or have a greenish tinge.

A highly important discovery by Hammarsten and Lindberger is to the effect that wood alcohol poisoning chiefly has to do with the crude wood naphtha, which contains toxic impurities mostly unidentified, and which comprise fusel oil. The author would, therefore, substitute some other form for wood alcohol poisoning. In home distilled brandy there are the same unknown or partly known impurities as occur in crude wood spirit. According to the author we know next to nothing of the toxic effects of pure methyl alcohol. It was once used in medicine and may still be found in old materia medicas with dosage of 15 to 45 minims.

Telescopic Discovery.

The occurrence of a cycle of development of life upon the moon is claimed as having been proved, says a New York cablegram of Monday last. Prof. Pickering, Harvard University, states that he has established it by observation. In the absence of a permanent atmosphere, it is assumed the brief daytime activities occur in an atmosphere of steam—which must be dissociated by the sun' rays as carbonic acid is here, so as to provide for the chemical energy essential in life processes. From a chemical aspect, therefore, this speculation is especially curious. The vapour may include hydrocarbons. Prof. Pickering declares his conviction that the markings often observed on the face of our satellite actually represent areas of vegetation. Two crops grow every day on the moon, the day of the moon being a period of 14 of our days. In the craters with which the surface of the moon is studded there is water and heat, and he has observed steam issuing from them. When the moon emerges from its period of darkness the sun's rays start a mushroom-like growth in the crater fields. He has, he asserts, actually been able to distinguish the patterns of the growing fields. We find, therefore, he concludes, a living world at our very doors, where life in some respects resembles that on Mars, but utterly unlike anything on our own planet.

Matter intended for the current weeks' "Optician" must reach this office on the Tuesday morning preceding publication.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

FINEST
ROUGH CYLINDER BLANKS,

Also good 2nd Selection
A very attractive proposition for Export and cheaper work.

CHANCE'S GLASS USED.

ACTUAL MANUFACTURERS
ASSOCIATED OPTICAL WORKS, Ld
5, Queen's Buildings, London, W.1
Near Tottenham Court Road.
No Connection with any other Firm. Telephone: Museum 2216.

C. SWAIN, Ltd.,
51, Strand, London.

A B C Code 5th Ed.
'Phone:—GERRARD 5179. Factory: FOREST GATE.

UNCUT
Sphs
Sph Cyls
Plano Cyls

A.O.C. EDGED
Peris & Bi
Cx & Cc etc.,

at Best Prices.

Telephone **JAMES B. SLY,** Central 10280.
9 & 10, EDWARD ST., WARDOUR ST.
LONDON, W. 1

To S.M.C., B.O.A. & I.O.O. DIPLOMA HOLDERS

Oak frames and modelled gold Arms for the diplomas The Arms of the S.M.C., City of London, and devices of the I.O.O., B.O.A. and Ph. Society in water colours, and framed dark oak, with descriptive engraved plate affixed, 27/6 each. Packed and put on rail.



Printed & Embossed Optical Stationery.
Steel Dies for use of Diploma Holders.
Electros of Coat of Arms & Optical Devices.
Engraved Seals, Prescription Forms, Signs, etc.
Price List on application.

Electro No. 12 Price 3/6

WILLESDEN
IS A BIG PLACE

There is more than one Optical house in Willesden but only one W.O.W.

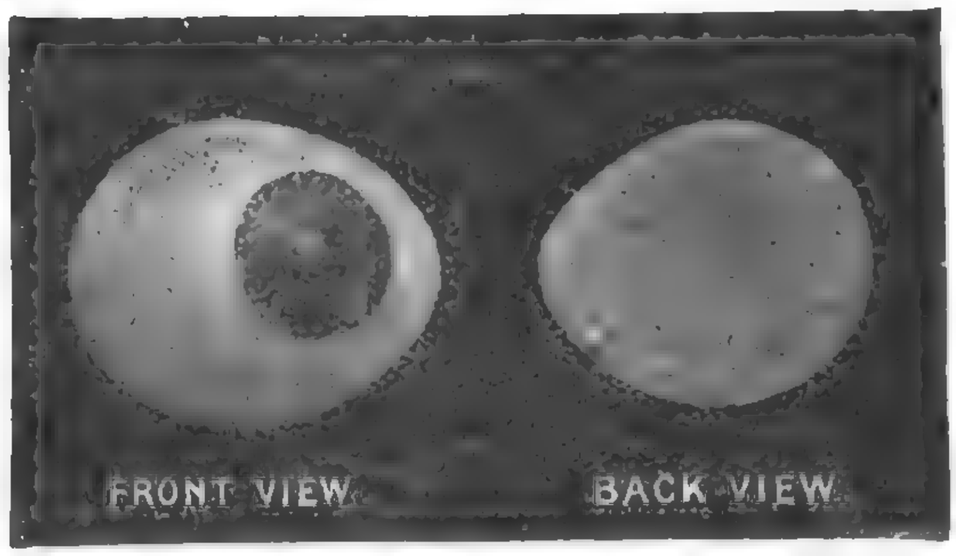
We are not connected in any way with other Optical concerns in Willesden or elsewhere.

Keep W.O.W. distinct in your mind.

Think of quality and W.O.W. as synonymous terms—and you are right.

WILLESDEN OPTICAL WORKS, LTD.
LENS FACTORY:
DUDDEN HILL LANE, N.W.10

SNELLEN'S IMPROVED ARTIFICIAL EYES
PACHE & SON, 75, Station St., Birmingham.



MAKERS TO THE PRINCIPAL HOSPITALS.
Selection sent to Surgeons. Also Makers of the ordinary Shell Eye.

THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER

Subscription Form. **123-125, Fleet Street, London. E.C.4., England.**

Send a copy each week of THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER post free for which we enclose .....shillings for..... ..weeks.

UNITED KINGDOM 17s.
and ABROAD 20s.

Name..... .....
Business.....
Address..... ....
.....

A remittance of 17s. (or 20s. Abroad) for 52 issues includes "THE OPTICAL ALMANAC" post free.
Cheques made payable to The Hatton Press Ltd.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings 1s3d per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

WANTED to Purchase. A Sutcliffe adjustable trial frame, with celluloid placquets. Either new or second-hand. C.C., 16, Wigmore Street, W.1.

WANTED, Trial Case, cheap. Box 3488, c/o "The Optician," 125, Fleet Street, E.C.4.

BARGAIN. Lens drilling machine with diamond, nearly new. Apply, Box 3489, c/o "The Optician," 125, Fleet Street, E.C.4.

AUSTRALIAN OPALS. Direct from Australia. Sing'e stones or quantities. Beautiful colours. L'sts free. Optical goods or scientific instruments in exchange. Correspondence invited. Seward, Optician, Melbourne, Australia.

FOR SALE. Fine 4-prism Browning Spectrometer in perfect condition. Complete with three eye-pieces, and all accessories. Can be inspected in London by appointment. Reply, Box 3486, c/o "The Optician," 125, Fleet Street, E.C.4.

FOR SALE. Half-plate stand camera, mahogany, 10" ext. Beck-Steinheil Unofocal Ser. 1., No. 5. f/6 with Beck Celverex shutter, T,B to 1/80 sec, 3 mahogany double dark slides, stand, focusing cloth, waterproof case, the who'e £3 10s. Also ¼-plate Holborn reflex, magazine 12, I'ex. R.R. f/77. T. and I to 1/100 sec. Leather case, £2. Please address, Box 3475, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

ON SALE. Well-established private optical practice, modern electrical workshop equipment, situated in large i..dustrial Lancashire town. Principals only. Box 3487, c/o "The Optician," 125, Fleet Street, E.C.4.

HIGH-CLASS optical business wanted. Provincial preferred. Must have good connection and turnover of not less than £3,000. Apply, Box 3485, c/o "The Optician," 125, Fleet Street, E.C.4.

SHOP with rooms wanted, London. 20, Mercer's Road, N.

Employment Bureau. *Concluded from page 4*

GLAZIER, female, shortly disengaged, requires situation, piece-work preferred. D.D., 80, Garthorne Road, Forest Hill, S.E.23.

RECEPTIONIST. Young Lady, 21, experienced shorthand typist and general office routine, 5 years with leading firm of opticians. Box 5685, c/o "The Optician," 125, Fleet Street, E.C.4.

OPTICAL Ass'stant required for North East town, efficient with lens bench and general routine. Apply, Box 5697, c/o "The Optician," 125, Fleet Street, E.C.4.

SITUATION wanted with retail London optician by young lady assistant, smart saleswoman, can neutralise and do repairs. 5 years' reference. Knowledge of shorthand and typing. Miss Sellwood, 36, Talbot Road, West Ealing, W.

REFRACTIONIST seeks position as manager or assistant, 17 years' experience, thoroughly practical and reliable, energetic, tall, age 33, good appearance, reference present employer. "Ophthalmic," 63, Broad Street, Bristol.

REFRACTIONIST (30), with 10 years' City experience, desires change, Manchester district preferred. Box 5693, c/o "The Optician," 125, Fleet Street, E.C.4.

GLASS Blower seeks situation, good references. F. O., 3, Sidmouth Street, Gray's Inn Road, W.C.

SCIENTIFIC and Mechanical engineer requires situation, home or abroad. Thoroughly experienced in all optical instruments and machines. Capable draughtsman designer. Box 5692, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED Assistant wishes position with Midland firm. Box 5698, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. and F.S.M.C.

Tuition by post under Expert Tutors. Courses for Diploma Examinations. Short period classes before each examination are given at Manchester. Residence provided.

Apply for particulars to Secretary,

PENNINGTONS, University Tutors, 254, Oxford Road, Manchester

PERCY S. DE SAULLES.

Manufacturer of . . .

MICROSCOPICAL GLASS SLIDES

Micro Cover Glasses, Glass Cells and Cavity Slips, etc.

The Platts, Amblecote, Stourbridge.

OPHTHALMIC AND SCIENTIFIC

MOULDINGS

Supplied in any Curvature and Glass.

CROOKES A SPECIALITY.

REYNOLDS & BAILEY, 15-19, VINE ST., LONDON, E.C.1



OPTICAL BLOCKS

To illustrate all features of Optical Service. Write for Lists.

Chemists' Design Service,

12, Humberstone Gate, Leicester.

C. BAKER 244 HIGH HOLBORN LONDON

REPAIRS

to all kinds of Scientific Apparatus carried out in our own Factory.

Estab. 1765 Work Returned Promptly. Charges Low

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.

C. G. DYMOND, M.I.Mech.E., F.I.C.P.A

W. P. THOMPSON & CO.,

12, CHURCH STREET, LIVERPOOL.

Chartered Patent Agents.

H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A.

J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

T. WHEELER,

Scientific Instrument Manufacturer,

Specialities: POCKET SURVEYING and ABRONAUTICAL ANEROIDS.

217, GOSWELL ROAD, LONDON, E.C. 1

ESTABLISHED 1878 TELEPHONE CITY 419

SPECTACLES & EYEGLASSES.

Their Forms, Mounting and Proper Adjustment by R. J. PHILLIPS, M.D.

Fourth edition revised with 56 illustrations.

Price 6s. 6d. Post Free 7s.

THE HATTON PRESS, Ltd., 125, Fleet Street, London, E.C.4

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Key to Successful Business is the Trade Paper.

If you advertise, the trade paper gives you a 100 per cent. market; all the readers have a direct business interest in your goods, there is no waste circulation.

If you subscribe, it gives you the latest trade news and technical information. To-day, it is more necessary than ever to be up-to-date in your business; the trade paper will keep you posted. Here are some progressive journals which offer you valuable service as an advertiser, or as a reader.

Aeroplane (London).
Agricultural Gazette (London).
Art Trade Journal (London).
Auto-Cyclist (Sydney).
Automobile Engineer (London).
Auto-Motor Journal (London).
Baker's Confectioners' and Caterers' National Association Review (Lond.)
Bioscope (London).
Box Makers' Journal (Manchester).
Brewers' Gazette (London).
Brick and Pottery Trades' Journal (London).
British and Colonial Mineral Water Trade Journal (Cardiff).
British and Colonial Pharmacist (London).
British Baker (London).
British Builder (London).
British Journal of Photography (London).
Chemical News (London).
China Clay Trade Review (London).
Confectionery Journal (London).
Cooper's Vehicle Journal (London).
Corn Trade News (Liverpool).
Dairy & Creamery Journal (London).
Dairyman (London).
Decorator (London).
Drapers' Organiser (London).
Electric Vehicle (London).
Electrical Industries and Investments (London).
Electricity (London).
Electrics (London).
Engineering Production (London).
Engineering Review (London).
Engineering World (Manchester).
Fancy Goods Record (London).
Fertiliser and Feeding Stuffs Journal (London).
Flight and The Aircraft Engineer (London).
Footwear Organiser (London).
Freemason and Masonic Illustrated (London).
Furnishing Trades' Organiser (London).
Furniture Record and the Furnisher (London).
Games and Toys (London).
Gas and Oil Power (London).
Hardwareman and Ironmonger's Chronicle (London).
Ice and Cold Storage (London).
India Rubber Journal (London).
Indian Industries and Power (Bombay and Calcutta).
Indian Medical Gazette (Calcutta).
Indian Motor News (Bombay and Calcutta).
Indian and Eastern Engineer (Calcutta).
Journal of Decorative Art (Manchester).
Licensing World (London).
"Locomotive" & Railway Carriage and Wagon Review (London).
Managing Engineer (London).
Marine Engineer & Naval Architect (London).
Mechanical World (Manchester and London).
Milling (Liverpool).
Model Engineer and Electrician (London).
Motor Cycle and Cycle Trader (London).
Motor Export Trader (London).
Motor in Australia (Sydney).
Motor Magazine of Canada (Toronto)
Motor Trade of Canada (Toronto).
Motor Trader & Review (London).
Motoring in South Africa (Cape Town).
Motorist & Wheelman (Perth, W.A.).
Music Trades Review (London).
N.Z. Motor Journal (Auckland, N.Z.).
Optician and Scientific Instrument Maker (London).
Organizer (London).
Outfitter (London).
Paper Box and Bag Maker (London.)
Paper Container (London).
Paper Maker & British Paper Trade Journal (London).
Photographic Dealer (London).
Power Laundry (London).
South African Motorist (Johannesburg).
South Australian Motor (Adelaide, S. Australia).
Sports Trades Journal (London).
Stationery World and Fancy Goods Review (London).
Steering Wheel (Brisbane).
Stone Trades' Journal (London).
Sugar Journal, International (London).
Talking Machine News (London).
Textile Manufacturer (Manchester).
Textile Mercury (Manchester).
Textile Recorder (Manchester).
Toyshop and Fancy Goods Journal (London).
Waste Trade World (London).
W.A. Motorist (Perth, W.A.).
Wireless World (London).
World's Carriers' & Carrying Trades' Review (London).

The address of any Paper in this list may be obtained from the Secretary of the

British Association of Trade & Technical Journals, Ltd.,

Sicilian House, Southampton Row. **London, W.C. 1** **Telephone No.: Holborn 395**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

A.—**Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

OPTICAL. Refractionist, holding S.M.C. or B.O.A. diploma required for high-class British firm in the East, age 25 to 33, single. Excellent opening. Write, giving full details of experience to Box 1064, Willings, Moorgate Arcade, E.C.2.

EXPERIENCED Female cutter and glazier required by Alfred Mills & Co., 22-23, Verulam Street, W.C.

SURFACE Worker wanted by prominent wholesale house, to act as charge hand. Thorough knowledge of all-round high class prescription work essential. Apply, stating experience and wages required to Box 5694, c/o "The Optician," 125, Fleet Street, E.C.4.

RAYNER, 9, Vere Street, London, W.1. Vacancies. Dispensing only. Junor assistant for Liverpool branch. Junior assistant for Leamington branch. Senior assistant (able to take charge) Yorkshire branch. Write, giving full particulars of experience, salary, etc.

METEOROLOGICAL and Scientific instrument maker, disengaged, requires position, maker or repairer, hand-turning, bench work, finishing, lacquering, own tools, 18 years' experience, any distance. F. Orford, 83, Ashmore Road, Paddington, W.9.

YOUNG MAN, 20, four years' experience in frame and eyeglass fitting with local dispensing optician requires situation with sight-testing optician. Disengaged. Reply H. E. Postlethwaite, 63, Earle Road, Edgehill, Liverpool.

POSITION required in block or prescription surfacing. Able to take complete control of any surfacing plant. Good references. Apply, Box 5695, c/o "The Optician," 125, Fleet Street, E.C.4.

APPRENTICESHIP wanted with good firm to learn all round gold spectacle making (leaving school). Scrivener, 4, College Street, Islington, N.1.

JUNIOR Assistant required with knowledge of sight-testing and general optical and photographic apparatus. Write giving full particulars of experience, etc., to W. Watson & Glover, 2, Easy Row, Birmingham.

SECOND Year student Northampton Institute requires position with sight-testing or wholesale opticians. Sound knowledge of all Rx work, machine and hand edging, slight knowledge of single surfacing. Box 5696, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, all-round worker, rimless fitting essential. Good opportunity. Male or female. Write stating experience and salary required. References. The Clyde Optical Works, 80, Great Clyde Street, Glasgow.

WHOLESALE Rx house have vacancies for female rimless fitter, cutter and glazier, order clerk for stockroom. Good wages to first class workers. Apply Box 5699, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACER requires situation, used to best prescription work, life-time experience, age 36. Ex-service man, good references. W. H., 1a, Ebenezer Buildings, Rotherfield Street, N.1.

SURFACER, 24, seeks position London or suburbs. Accustomed to prescription work. T.D., 251, East India Dock Road, Poplar, E.14.

F.S.M.C. seeks re-engagement as managing assistant in good class consulting business. London interview. Box 5690 c/o "The Optician," 125, Fleet Street, E.C.4.

LONDON or Provinces. Position required by young lady in retail opticians. West End experience in all prescription and counter-work. Knowledge of glazing and rimless fitting. Box 5684, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. Thoroughly capable manager desires change. Branch management preferred, used to full control. O. & S. methods. Integrity and careful service, married, aged 35. Apply, Box 5679, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, age 21, with 5 years' experience in sight-testing seeks situation. Good appearance and conscientious worker. Box 5689, c/o "The Optician," 125, Fleet Street, E.C.4.

INSTRUMENT Test room assistant, intelligent and ambitious requires permanency. Any capacity, 12 years' instrument work, factory routine, administrative work, etc. Box 5688, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION required by energetic man (24), single, partly qualified. Go anywhere, but in or near London preferred. Sound knowledge of optical business routine, good sight-tester, excellent references. Box 5687, c/o "The Optician," 125, Fleet Street, E.C.4.

OPTICIAN, holding F.S.M.C. diploma desires position in good retail establishment, good appearance, reference present employer. Box 5686, c/o "The Optician," 125, Fleet Street, E.C.4.

JEWELLERY, first assistant, must have knowledge of optics, qualified preferred. Manchester district. Full particulars. Box 5680, c/o "The Optician," 125, Fleet Street, E.C.4.

CAPABLE Surfacer, single, disengaged, seeks situation. Any locality, moderate wages. Apply, W. Collett, Dunton Green, Kent.

POSITION required by experienced sight-testing assistant (21) with photographic experience. Competent and careful tester. Disengaged. Reply, J. W., 15, Frene Street, Everton Road, Manchester.

YOUTH, 17, seeks apprenticeship with optician or instrument maker in London. Good references. No premium. J. Applin, 36, Greenham Road, Muswell Hill, N.10.

CAPABLE Refractionist desires change. All-round Rx hand. London or Manchester preferred. Sober, reliable. Box 5678, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION wanted by refractionist, 34, tall, 12 years' London and provincial experience. Enterprising and reliable. Disengaged. Box 5677, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST seeks position where further instruction could be gained in ophthalmoscopy, etc. Well up at repairs, fitting, etc. Moderate salary. Box 5676, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Lady, age 20, seeks situation as invoice and accounts typist, 3½ years' experience, excellent references. W.W., 52, Fitzroy Road, Regent's Park, N.W.1.

YOUNG MAN with thorough experience of sight-testing and photography, requires position. Entering B.O.A. exam. in November. Age 28. Box 5669, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, situation as first-class all round gold worker and jobber. Good references. Address Box 5667, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. 30 years of age, with 12 years' pharmacy experience, requires position with optician or chemist-optician. Good salesman and good references. Box 5670, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED Optician, F.S.M.C., F.I.O., practical watchmaker, keen salesman, desires responsible position in optics or jewellery-optics business. Immediate engagement. Box 5681, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION wanted by qualified assistant, capable of taking charge. Within 20 miles Walsall preferred. Box 5674, c/o "The Optician," 125, Fleet Street, E.C.4.

Concluded on page 2.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE

U.K. TORIC LENSES.

We beg to announce that in future we propose making our FINISHED TORICS Base + 6.0 with MINUS as well as PLUS cylindrical power. That is to say our Base + 6.0 Torics will be worked in two forms.

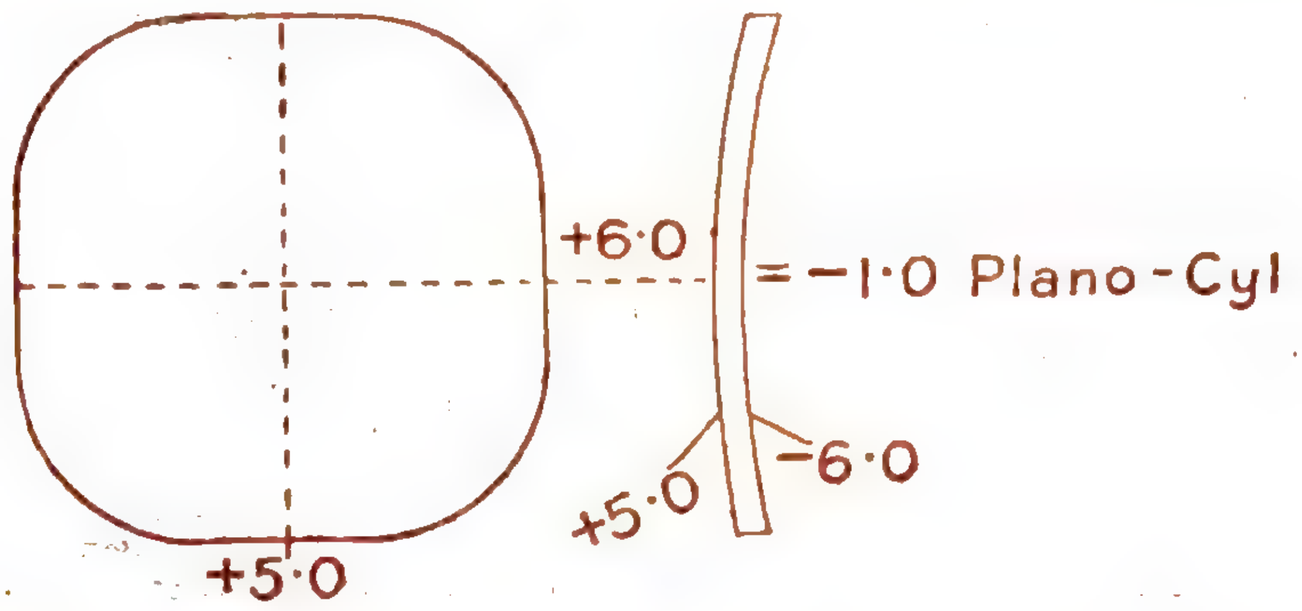
(1) Torics for PLUS combinations will have the Toric surfaces with the curve in one meridian + 6.0 and the curve in the other meridian deeper according to the (+) cylindrical power.

(2) Torics for MINUS combinations will have the Toric surfaces with the curve in one meridian + 6.0 and the curve in the other meridian shallower according to the (−) cylindrical power.

The advantages are that MINUS lenses will not require to be surfaced on excessively deep concave tools and the axis of the cylinder remains constant with the + 6.0 Base curve.

All Plano-Cylinders whether Plus or Minus will be worked with a − 6.0 spherical surface.

The diagram illustrates the 2nd form and it will be seen that by adding the spherical power required to − 6.0 the correct surfacing tool is given without having to transpose the cylinder.



Convex Toric Blanks can be supplied in either of these forms but unless specifically ordered the + 6.0 and deeper curve will be supplied.

Whilst making this announcement we beg to state that our Concave Torics are only made with − 6.0 Base curve and deeper, until the Cylindrical Power exceeds − 4.0 when we make the Base Curve − 4.0.

A selection from these Toric blanks will permit most Rx to be produced with the best appearance and effect.

UNITED KINGDOM OPTICAL CO., LTD.,

(Wholesale and Export Only.)

MILL HILL, LONDON, N.W.7

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings 1s3d per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

WANTED to Purchase. A Sutcliffe adjustable trial frame, with celluloid placquets. Either new or second-hand. C.C., 16, Wigmore Street, W.1.

WANTED, Trial Case, cheap. Box 3488, c/o "The Optician," 125, Fleet Street, E.C.4.

BARGAIN. Lens drilling machine with diamond, nearly new. Apply, Box 3489, c/o "The Optician," 125, Fleet Street, E.C.4.

AUSTRALIAN OPALS. Direct from Australia. Sing'e stones or quantities. Beautiful colours. L'sts free. Optical goods or scientific instruments in exchange. Correspondence invited. Seward, Optician, Melbourne, Australia.

FOR SALE. Fine 4-prism Browning Spectrometer in perfect condition. Complete with three eye-pieces, and all accessories. Can be inspected in London by appointment. Reply, Box 3486, c/o "The Optician," 125, Fleet Street, E.C.4.

FOR SALE. Half-plate stand camera, mahogany, 10" ext. Beck-Steinheil Unofocal Ser. 1., No. 5. f/6 with Beck Celverex shutter, T,B to 1/80 sec, 3 mahogany double dark slides, stand, focusing cloth, waterproof case, the who'e £3 10s. Also ¼-plate Holborn reflex, magazine 12, I'ex. R.R. f/77. T. and I to 1/100 sec. Leather case, £2. Please address, Box 3475, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

ON SALE. Well-established private optical practice, modern electrical workshop equipment, situated in large industrial Lancashire town. Principals only. Box 3487, c/o "The Optician," 125, Fleet Street, E.C.4.

HIGH-CLASS optical business wanted. Provincial preferred. Must have good connection and turnover of not less than £3,000. Apply, Box 3485, c/o "The Optician," 125, Fleet Street, E.C.4.

SHOP with rooms wanted, London. 20, Mercer's Road, N.

Employment Bureau. *Concluded from page 4*

GLAZIER, female, shortly disengaged, requires situation, piece-work preferred. D.D., 80, Garthorne Road, Forest Hill, S.E.23.

RECEPTIONIST. Young Lady, 21, experienced shorthand typist and general office routine, 5 years with leading firm of opticians. Box 5685, c/o "The Optician," 125, Fleet Street, E.C.4.

OPTICAL Assistant required for North East town, efficient with lens bench and general routine. Apply, Box 5697, c/o "The Optician," 125, Fleet Street, E.C.4.

SITUATION wanted with retail London optician by young lady assistant, smart saleswoman, can neutralise and do repairs. 5 years' reference. Knowledge of shorthand and typing. Miss Sellwood, 36, Talbot Road, West Ealing, W.

REFRACTIONIST seeks position as manager or assistant, 17 years' experience, thoroughly practical and reliable, energetic, tall, age 33, good appearance, reference present employer. "Ophthalmic," 63, Broad Street, Bristol.

REFRACTIONIST (30), with 10 years' City experience, desires change, Manchester district preferred. Box 5693, c/o "The Optician," 125, Fleet Street, E.C.4.

GLASS Blower seeks situation, good references. F. O., 3, Sidmouth Street, Gray's Inn Road, W.C.

SCIENTIFIC and Mechanical engineer requires situation, home or abroad. Thoroughly experienced in all optical instruments and machines. Capable draughtsman designer. Box 5692, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED Assistant wishes position with Midland firm. Box 5698, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. and F.S.M.C.

Tuition by post under Expert Tutors. Courses for Diploma Examinations. Short period classes before each examination are given at Manchester. Residence provided.

Apply for particulars to Secretary,

PENNINGTONS, University Tutors, 254, Oxford Road, Manchester

PERCY S. DE SAULLES.

Manufacturer of . . .

MICROSCOPICAL GLASS SLIDES

Micro Cover Glasses, Glass Cells and Cavity Slips, etc.

The Platts, Amblecote, Stourbridge.

OPHTHALMIC AND SCIENTIFIC

MOULDINGS

Supplied in any Curvature and Glass.

CROOKES A SPECIALITY.

REYNOLDS & BAILEY, 15-19, VINE ST., LONDON, E.C.1



OPTICAL BLOCKS

To illustrate all features of Optical Service. Write for Lists.

Chemists' Design Service,

12, Humberstone Gate, Leicester.



REPAIRS

to all kinds of Scientific Apparatus carried out in our own Factory.

Estab. 1765 Work Returned Promptly. Charges Low

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.

C. S. DYMOND. M.I.Mech.E., F.I.C.P.A

W. P. THOMPSON & CO.,

12, CHURCH STREET, LIVERPOOL.

Chartered Patent Agents.

H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A.

J. V. ARMSTRONG. M.I.I., F.I.C.P.A.

T. WHEELER,

Scientific Instrument Manufacturer,

Specialities: POCKET SURVEYING and AERONAUTICAL ANEROIDS

217, GOSWELL ROAD, LONDON, E.C. 1

ESTABLISHED 1878 TELEPHONE CITY 419

SPECTACLES & EYEGLASSES,

Their Forms, Mounting and Proper Adjustment by R. J. PHILLIPS, M.D.

Fourth edition revised with 56 illustrations.

Price 6s. 6d. Post Free 7s.

THE HATTON PRESS, Ltd., 125, Fleet Street, London, E.C.4

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Key to Successful Business is the Trade Paper.

If you advertise, the trade paper gives you a 100 per cent. market; all the readers have a direct business interest in your goods, there is no waste circulation.

If you subscribe, it gives you the latest trade news and technical information. To-day, it is more necessary than ever to be up-to-date in your business; the trade paper will keep you posted. Here are some progressive journals which offer you valuable service as an advertiser, or as a reader.

Aeroplane (London).
Agricultural Gazette (London).
Art Trade Journal (London).
Auto-Cyclist (Sydney).
Automobile Engineer (London).
Auto-Motor Journal (London).
Baker's Confectioners' and Caterers' National Association Review (Lond.)
Bioscope (London).
Box Makers' Journal (Manchester).
Brewers' Gazette (London).
Brick and Pottery Trades' Journal (London).
British and Colonial Mineral Water Trade Journal (Cardiff).
British and Colonial Pharmacist (London).
British Baker (London).
British Builder (London).
British Journal of Photography (London).
Chemical News (London).
China Clay Trade Review (London).
Confectionery Journal (London).
Cooper's Vehicle Journal (London).
Corn Trade News (Liverpool).
Dairy & Creamery Journal (London).
Dairyman (London).
Decorator (London).
Drapers' Organiser (London).
Electric Vehicle (London).
Electrical Industries and Investments (London).
Electricity (London).
Electrics (London).
Engineering Production (London).
Engineering Review (London).
Engineering World (Manchester).
Fancy Goods Record (London).
Fertiliser and Feeding Stuffs Journal (London).
Flight and The Aircraft Engineer (London).
Footwear Organiser (London).
Freemason and Masonic Illustrated (London).
Furnishing Trades' Organiser (London).
Furniture Record and the Furnisher (London).
Games and Toys (London).
Gas and Oil Power (London).
Hardwareman and Ironmonger's Chronicle (London).
Ice and Cold Storage (London).
India Rubber Journal (London).
Indian Industries and Power (Bombay and Calcutta).
Indian Medical Gazette (Calcutta).
Indian Motor News (Bombay and Calcutta).
Indian and Eastern Engineer (Calcutta).
Journal of Decorative Art (Manchester).
Licensing World (London).
"Locomotive" & Railway Carriage and Wagon Review (London).
Managing Engineer (London).
Marine Engineer & Naval Architect (London).
Mechanical World (Manchester and London).
Milling (Liverpool).
Model Engineer and Electrician (London).
Motor Cycle and Cycle Trader (London).
Motor Export Trader (London).
Motor in Australia (Sydney).
Motor Magazine of Canada (Toronto)
Motor Trade of Canada (Toronto).
Motor Trader & Review (London).
Motoring in South Africa (Cape Town).
Motorist & Wheelman (Perth, W.A.).
Music Trades Review (London).
N.Z. Motor Journal (Auckland, N.Z.).
Optician and Scientific Instrument Maker (London).
Organizer (London).
Outfitter (London).
Paper Box and Bag Maker (London.)
Paper Container (London).
Paper Maker & British Paper Trade Journal (London).
Photographic Dealer (London).
Power Laundry (London).
South African Motorist (Johannesburg).
South Australian Motor (Adelaide, S. Australia).
Sports Trades Journal (London).
Stationery World and Fancy Goods Review (London).
Steering Wheel (Brisbane).
Stone Trades' Journal (London).
Sugar Journal, International (London).
Talking Machine News (London).
Textile Manufacturer (Manchester).
Textile Mercury (Manchester).
Textile Recorder (Manchester).
Toyshop and Fancy Goods Journal (London).
Waste Trade World (London).
W.A. Motorist (Perth, W.A.).
Wireless World (London).
World's Carriers' & Carrying Trades' Review (London).

The address of any Paper in this list may be obtained from the Secretary of the

British Association of Trade & Technical Journals, Ltd.,

Sicilian House, Southampton Row.

London, W.C. 1

Telephone No.: Holborn 395

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

A.—**Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

OPTICAL. Refractionist, holding S.M.C. or B.O.A. diploma required for high-class British firm in the East, age 25 to 33, single. Excellent opening. Write, giving full details of experience to Box 1064, Willings, Moorgate Arcade, E.C.2.

EXPERIENCED Female cutter and glazier required by Alfred Mills & Co., 22-23, Verulam Street, W.C.

SURFACE Worker wanted by prominent wholesale house, to act as charge hand. Thorough knowledge of all-round high class prescription work essential. Apply, stating experience and wages required to Box 5694, c/o "The Optician," 125, Fleet Street, E.C.4.

RAYNER, 9, Vere Street, London, W.1. Vacancies. Dispensing only. Junor assistant for Liverpool branch. Junior assistant for Leamington branch. Senior assistant (able to take charge) Yorkshire branch. Write, giving full particulars of experience, salary, etc.

METEOROLOGICAL and Scientific instrument maker, disengaged, requires position, maker or repairer, hand-turning, bench work, finishing, lacquering, own tools, 18 years' experience, any distance. F. Orford, 83, Ashmore Road, Paddington, W.9.

YOUNG MAN, 20, four years' experience in frame and eyeglass fitting with local dispensing optician requires situation with sight-testing optician. Disengaged. Reply H. E. Postlethwaite, 63, Earle Road, Edgehill, Liverpool.

POSITION required in block or prescription surfacing. Able to take complete control of any surfacing plant. Good references. Apply, Box 5695, c/o "The Optician," 125, Fleet Street, E.C.4.

APPRENTICESHIP wanted with good firm to learn all round gold spectacle making (leaving school). Scrivener, 4, College Street, Islington, N.1.

JUNIOR Assistant required with knowledge of sight-testing and general optical and photographic apparatus. Write giving full particulars of experience, etc., to W. Watson & Glover, 2, Easy Row, Birmingham.

SECOND Year student Northampton Institute requires position with sight-testing or wholesale opticians. Sound knowledge of all Rx work, machine and hand edging, slight knowledge of single surfacing. Box 5606, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, all-round worker, rimless fitting essential. Good opportunity. Male or female. Write stating experience and salary required. References. The Clyde Optical Works, 80, Great Clyde Street, Glasgow.

WHOLESALE Rx house have vacancies for female rimless fitter, cutter and glazier, order clerk for stockroom. Good wages to first class workers. Apply Box 5699, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACER requires situation, used to best prescription work, life-time experience, age 36. Ex-service man, good references. W. H., 1a, Ebenezer Buildings, Rotherfield Street, N.1.

SURFACER, 24, seeks position London or suburbs. Accustomed to prescription work. T.D., 251, East India Dock Road, Poplar, E.14.

F.S.M.C. seeks re-engagement as managing assistant in good class consulting business. London interview. Box 5690 c/o "The Optician," 125, Fleet Street, E.C.4.

LONDON or Provinces. Position required by young lady in retail opticians. West End experience in all prescription and counter-work. Knowledge of glazing and rimless fitting. Box 5684, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. Thoroughly capable manager desires change. Branch management preferred, used to full control. O. & S. methods. Integrity and careful service, married, aged 35. Apply, Box 5679, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, age 21, with 5 years' experience in sight-testing seeks situation. Good appearance and conscientious worker. Box 5689, c/o "The Optician," 125, Fleet Street, E.C.4.

INSTRUMENT Test room assistant, intelligent and ambitious requires permanency. Any capacity, 12 years' instrument work, factory routine, administrative work, etc. Box 5688, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION required by energetic man (24), single, partly qualified. Go anywhere, but in or near London preferred. Sound knowledge of optical business routine, good sight-tester, excellent references. Box 5687, c/o "The Optician," 125, Fleet Street, E.C.4.

OPTICIAN, holding F.S.M.C. diploma desires position in good retail establishment, good appearance, reference present employer. Box 5686, c/o "The Optician," 125, Fleet Street, E.C.4.

JEWELLERY, first assistant, must have knowledge of optics, qualified preferred. Manchester district. Full particulars. Box 5680, c/o "The Optician," 125, Fleet Street, E.C.4.

CAPABLE Surfacer, single, disengaged, seeks situation. Any locality, moderate wages. Apply, W. Collett, Dunton Green, Kent.

POSITION required by experienced sight-testing assistant (21) with photographic experience. Competent and careful tester. Disengaged. Reply, J. W., 15, Freme Street, Everton Road, Manchester.

YOUTH, 17, seeks apprenticeship with optician or instrument maker in London. Good references. No premium. J. Applin, 36, Greenham Road, Muswell Hill, N.10.

CAPABLE Refractionist desires change. All-round Rx hand. London or Manchester preferred. Sober, reliable. Box 5678, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION wanted by refractionist, 34, tall, 12 years' London and provincial experience. Enterprising and reliable. Disengaged. Box 5677, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST seeks position where further instruction could be gained in ophthalmoscopy, etc. Well up at repairs, fitting, etc. Moderate salary. Box 5676, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Lady, age 20, seeks situation as invoice and accounts typist, 3½ years' experience, excellent references. W.W., 52, Fitzroy Road, Regent's Park, N.W.1.

YOUNG MAN with thorough experience of sight-testing and photography, requires position. Entering B.O.A. exam. in November. Age 28. Box 5669, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, situation as first-class all round gold worker and jobber. Good references. Address Box 5667, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. 30 years of age, with 12 years' pharmacy experience, requires position with optician or chemist-optician. Good salesman and good references. Box 5670, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED Optician, F.S.M.C., F.I.O., practical watchmaker, keen salesman, desires responsible position in optics or jewellery-optics business. Immediate engagement. Box 5681, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION wanted by qualified assistant, capable of taking charge. Within 20 miles Walsall preferred. Box 5674, c/o "The Optician," 125, Fleet Street, E.C.4.

Concluded on page 2.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE

U.K. TORIC LENSES.

We beg to announce that in future we propose making our FINISHED TORICS Base + 6.0 with MINUS as well as PLUS cylindrical power. That is to say our Base + 6.0 Torics will be worked in two forms.

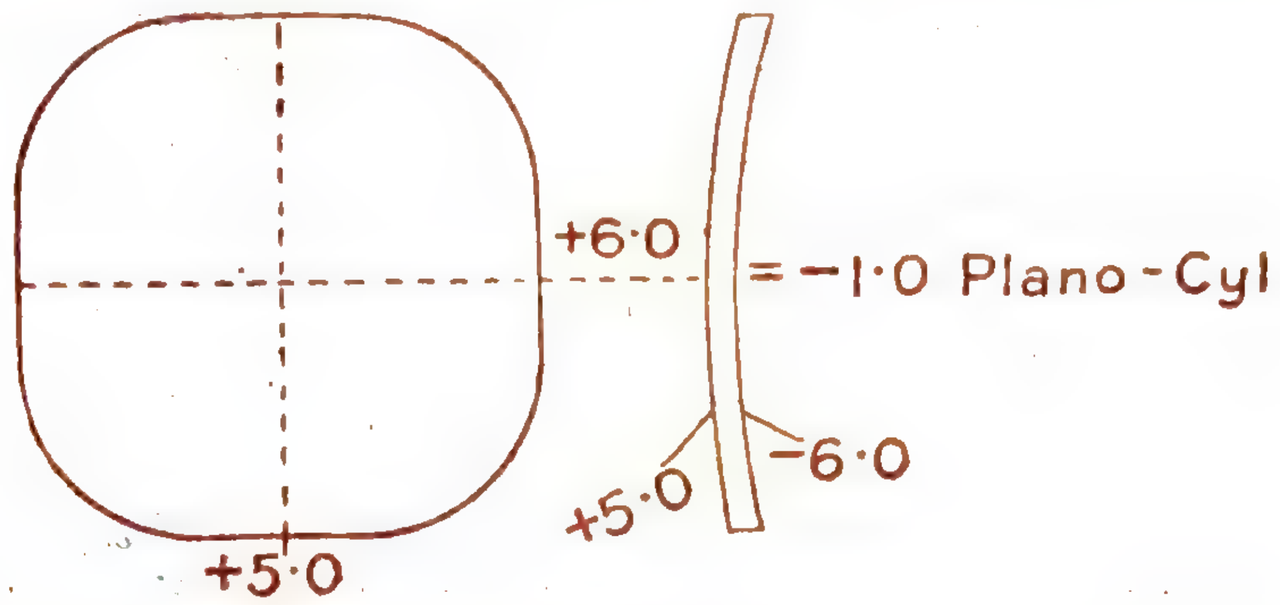
(1) Torics for PLUS combinations will have the Toric surfaces with the curve in one meridian + 6.0 and the curve in the other meridian deeper according to the (+) cylindrical power.

(2) Torics for MINUS combinations will have the Toric surfaces with the curve in one meridian + 6.0 and the curve in the other meridian shallower according to the (−) cylindrical power.

The advantages are that MINUS lenses will not require to be surfaced on excessively deep concave tools and the axis of the cylinder remains constant with the + 6.0 Base curve.

All Plano-Cylinders whether Plus or Minus will be worked with a − 6.0 spherical surface.

The diagram illustrates the 2nd form and it will be seen that by adding the spherical power required to − 6.0 the correct surfacing tool is given without having to transpose the cylinder.



Convex Toric Blanks can be supplied in either of these forms but unless specifically ordered the + 6.0 and deeper curve will be supplied.

Whilst making this announcement we beg to state that our Concave Torics are only made with − 6.0 Base curve and deeper, until the Cylindrical Power exceeds − 4.0 when we make the Base Curve − 4.0.

A selection from these Toric blanks will permit most Rx to be produced with the best appearance and effect.

UNITED KINGDOM OPTICAL CO., LTD.,

(Wholesale and Export Only.)

MILL HILL, LONDON, N.W.7

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE OPTICIAN
Reg. at G.P.O. as a Newspaper

AMERICAN OPTICAL COMPANY, LIMITED

Wellsworth Gold-filled Spectacle Mountings for Perfection of Detail.



When you buy staples, Gold-filled Frames and Mountings for example you want quality first. No freak of style or function is looked for—merely downright good clean-cut quality clear through.

Such quality in Gold-filled ware is possible only where experience, equipment or organisation and other manufacturing conditions are ideal, as they are in the great plant of the American Optical Company.

WELLSWORTH

TRADE (A) MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C. 4. (Printed by The Century Press, Fulham.) Oct. 14, 1921.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT-MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1595 FRIDAY, OCT. 21, 1921.

It's Quality That Counts



The stock that goes into Wellsworth gold filled frames and mountings is handled by Wellsworth workers and Wellsworth processes from the initial coin and bullion to the final drawing of gold filled wire. This is why Wellsworth Gold Filled Frames are superior in durability and in resistance to corrosion. They are Wellsworth made all the way.

When ordering from your jobber, ask for *Wellsworth* Gold Filled Frames.

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

AMERICAN OPTICAL COMPANY, LIMITED,

39, Hatton Garden, LONDON, E.C.1

Reg'd at the G.P.O. as a newspaper **PRICE 4d** *Subscription post free 12 months 17s*

Postage in United Kingdom 1d

Digitized by Google Original from THE OHIO STATE UNIVERSITY

GEORGE CULVER LTD

Manufacturing Opticians,

JOBBING AND PRESCRIPTION WORK

ACCURACY,

NEATNESS,

PROMPTNESS

Large and full stocks of English made Lenses of all combinations. Orders can be executed promptly.

OPTICAL WORKS:
WHITE LION STREET,
PENTONVILLE,
LONDON, N. 1

TELEPHONE:
NORTH 369 and 871

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

W.H.T.

WE DON'T HOPE FOR THE BEST, BUT GET IT

AND GIVE IT IN OUR PRESCRIPTION WORK

A SERVICE OF ACCURACY, EFFICIENCY, AND PROMPT DESPATCH.

LET US CONVINCE YOU.

OPHTHALMIC SUPPLIES

OF EVERY DESCRIPTION FROM THE TRIAL CASE TO THE EYEGLASS CHAIN.

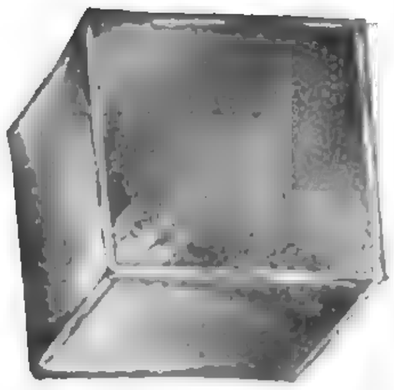
WALTER H. THOMPSON

66 HATTON GARDEN, LONDON, E.C. 1.

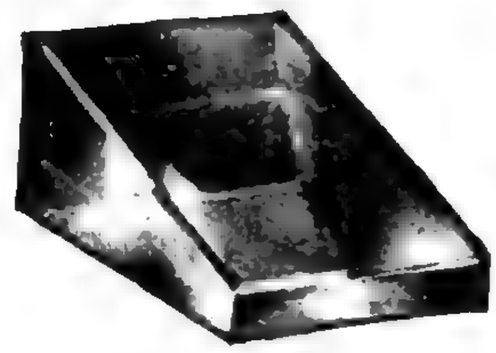
Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

J.&R.F. LTD



Glass Display Stands.

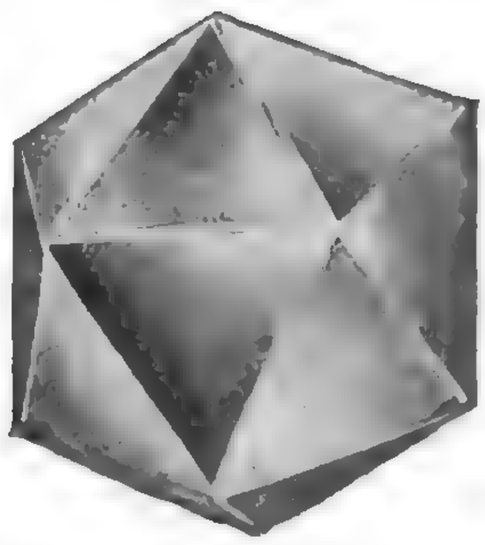


9031.

9033.

We have a large variety of glass display stands of different shapes in white and three colours.

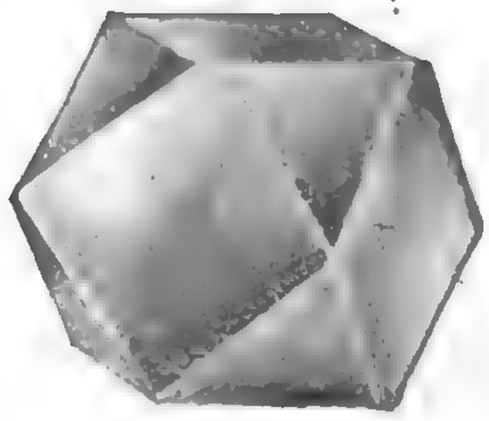
Particulars and Price List on Application.



9041



9050.



9042.

J. & R. FLEMING LTD.,

Telephone:
HOLBORN {814 / 815}
HOLBORN {2788 / 2789} Prescription Dept.

136-148 Clerkenwell Road,

LONDON, E.C. 1.

Telegrams:
"OTTICO." LONDON.

Branches with Prescription equipment:

WALTER BRAHAM & Co. Ltd.
6, Key Hill Drive,
BIRMINGHAM.
Phone: Central 2509
Telegrams: "Brahma."

37, WESTGATE STREET,
CARDIFF.
Phone: Cardiff 44
Telegrams: "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1085.
Telegrams: "Ottico."

8, SHUDEHILL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

J.&R.F. LTD

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
Col. & Ald. Sir CHARLES C. WAKEFIELD, Bt, C.B.E.

Upper Warden
The Rt. Hon. VISCOUNT HILL.

Renter Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Director of Examinations
The Rt. Hon. Sir WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS

of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., on Oct. 31st, 1921, and during the first week in November.

Membership—The diploma holders of the Guild number over a thousand.

N.B.—***All Letters, Communications & Payments should be made to the*** **Acting Clerk** ***of the Company, who is alone authorised to receive them***

The OPTICIAN And SCIENTIFIC INSTRUMENT·MAKER

THE OPTICAL ENGINEER

AND JOURNAL OF OPTOMETRY

31st Year **Vol. LXII.** **No. 1,595**

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Edited by CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. City 5616.

LONDON, FRIDAY, OCT. 21, 1921.

The Opportunity *of distributing to all important buyers at home and abroad, the advertising matter of wholesale and manufacturing optical firms occurs now. Within the next four days, we go to press with the Special Home, Colonial and Foreign Issue of this paper; and all of our friends who have decided to co-operate with us in our big "push" for better trade, are requested to send in their advertisement copy at once.*

* * *

South African Trade.—The Senior Trade Commissioner for South Africa, Mr. W. G. Wickham, who is now in this country, takes a very hopeful view of the future of trade so far as South Africa is concerned. It has been depressed, not because the demand for goods does not exist, but for the reason that traders ignore the necessity to cut their losses. Their stocks are not excessive, but they were purchased when costs ruled higher, and it is still hoped to realise a profit on the figures originally paid. On the other hand, the public have sensed the fall in prices, and are waiting until they are served on the fresh basis. Hence trade stands still, or comparatively still. There is, we are assured by Mr. Wickham, a real hunger for goods, and when the existing stocks have been cleared and supplies are forthcoming at a sufficiently tempting price, the demand will be generous and trade active, generally speaking. Specifically, there has been little or no depression of business among those who deal in spectacleware and such like, while the demand by the mines and the

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

government for scientific instruments has been steady and fairly normal; and, as we have mentioned, Mr. Wickham considers the South African general trade prospects quite promising, and the optical industry must participate in the revival.

* * *

Optical History.—Modern ophthalmic optics, which has made such immense advances on the work of the early spectacle-makers, dates for practical purposes from the writings of Donders and his contemporaries, though our readers are familiar with the names of still earlier pioneers. The origins of scientific sight-testing—prior to the first publication of *The Optician* in 1891—are become matters of merely academic interest however, recorded originally in the medical journals of the period. Coming to our own times, we find no epoch-making discoveries, but a vast amount of work in elucidating and elaborating the details of sight-testing and the principles on which spectacle lenses should be constructed. The last thirty years' progress in such investigations has been very fully recorded in the columns of *The Optician*. But from the viewpoint of optometrists or refractionists (and as will be very obvious, from the viewpoint of the public also) the outstanding feature of our modern optical history has been a great work of education, as distinct from investigation. At the time when *The Optician* was founded, it will be agreed that sight-testing opticians were comparatively few; and for practical purposes, glasses prescribed on scientific principles were available only to the wealthy who consulted a surgeon oculist, and to the poor who were treated as paupers at an eye hospital.

* * *

That great middle class (using the words financially, not socially) which is the majority of the people, received very inadequate service in the matter of prescribing of glasses. The need for the qualified optician—and many of him—was apparent. And the pre-requisite to supplying that need was education in optometry. As a vehicle of instruction to all those interested in learning the technique of sight-testing, *The Optician* proved its efficiency, thanks to the aid of contributors including one whose name is now a household word among ophthalmic opticians, as an author and teacher. This leads to another consideration, that the organisation of sight-testing opticians in a professional sense, meetings for technical discussions, examinations and so on, have been only less valuable than the tuition in visual optics upon which these movements depended for their effectiveness. Lastly, since skilled advice has been available for all, there has been need for the education of the public to consult a competent optician on the first experience of eyestrain or visual defect. That need has been and is being satisfactorily met.

* * *

Published Correspondence.—The foregoing notes refer to what is a commonplace for many of our readers, since the progress of organisation and qualification among sight-testing opticians has been fully (and until recent years for the most part exclusively) recorded in the columns of *The Optician*. Our remarks are prompted however, by a letter we have received for publication, and regret we are unable to publish. The writer of it maintains that "the late Mr. Aitchison was the real pioneer of the eyesight-testing business as now carried on." The only reason against publishing this letter is the nature of the personal remarks bearing on a gentleman (Mr. T. Henri) who was mentioned in "Fair-play's" communication last week. We always dislike suppressing correspondence; for in a popular sense, that is often the most interesting part of a newspaper. It is required however, that correspondents should conform with the rule laid down in a note headed "Expressions of Opinion" last week, which we need not repeat.

* * *

The law of newspaper libel is such as to encourage an action being brought on the most trivial grounds—not necessarily against the writer of the letter but against the newspaper which publishes it. Our readers may be surprised to learn that a writ for libel was issued against this paper within a very few years past. Of course the complaint was wholly unwarranted; but before the threatened action collapsed there was a demand on us to pay law costs. We refused to pay a penny; but none the less the time and trouble involved in correspondence left us out of pocket. These things are not worth while. Yet criticisms can be expressed in, if we may say so, a gentlemanly way, so as to be not actionable. And in the opinion of most cultured people, a temperately worded criticism is more forceful than ill-tempered libels. To apply to any individual such epithets as Baron Munchauson, Ananias, and so forth, may be quite amusing; but no matter how cleverly written, personal comments in this vein are not printed by the most respectable newspapers.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

An Elementary Theory of Deviation through Astigmatic Lenses.—III.

By E. MAYER (Paris).

When a straight line, which is observed through an astigmatic lens is rotated in a front plane, the apparent image seems to have another movement.

We shall suppose at first that the image is virtual in all meridians and refer to figs. (1) and (2). (See previous article.)

When x increases from 0°, y increases according to formula $y=p\ tg\ x$. The image Sl precedes the perspective L in its movement.

When $x=90°$, this perspective has rejoined the image.

When x increases from 90°, the image follows the perspective instead of preceding it.

When $x=180°$ the image rejoins the perspective L.

Then the same relative movements obviously take place when x increases from 180° to 360°.

Since the apparent image begins to precede the line and then is rejoined by it, angle δ between both lines passes from 0° to 0°, and is positive. Then there must be a position for which δ is maximum. This is what occurs when x is between 0 and 90°. When x passes from 90 to 180°, angle δ is negative and passes by a minimum, when its absolute value passes by a maximum.

In order to find these limits, let us refer to equation (6). This may be put in the following form:—

$$(7)\quad p\ tg\ \delta\ tg^2\ x-(p-1)\ tg\ x+tg\ \delta=0.$$

which gives

$$(8)\quad tg\ x=\frac{p-1\pm\sqrt{(p-1)^2-4\,p\,tg^2\,\delta}}{2\,p\,tg\,\delta}$$

It is evident that we have

$$4\,p\,tg^2\,\delta<p-1$$

The maximum of $tg\ \delta$ is given by formula

$$(9)\quad tg\ \delta_1=\frac{1-p}{2\sqrt{p}}$$

For this value of δ_1 x is given by equation

$$(10)\quad tg\ x_1=\frac{1}{\sqrt{p}}$$

For the same reason, the minimum δ_2 and the correspondent value x_2 are given by equations

$$(11)\begin{cases} tg\ \delta_2=\dfrac{1-p}{-2\sqrt{p}} \\ tg\ x_2=\dfrac{-1}{\sqrt{p}} \end{cases}$$

If you rotate the line L between +90° and −90°, angles x_1 and x_2 are equal and contrary. So are angles δ_1 and δ_2.

The values y_1 and y_2 of y which correspond to these are given by equation

$$(12)\begin{cases} tg\ y_1=\sqrt{p} \\ tg\ y_2=-\sqrt{p} \end{cases}$$

Angles y_1 and y_2 are equal and contrary.

Comparison between (10) and (11) shows that we have

$$x_1+y_2=90°.$$

$$x_2+y_1=90°.$$

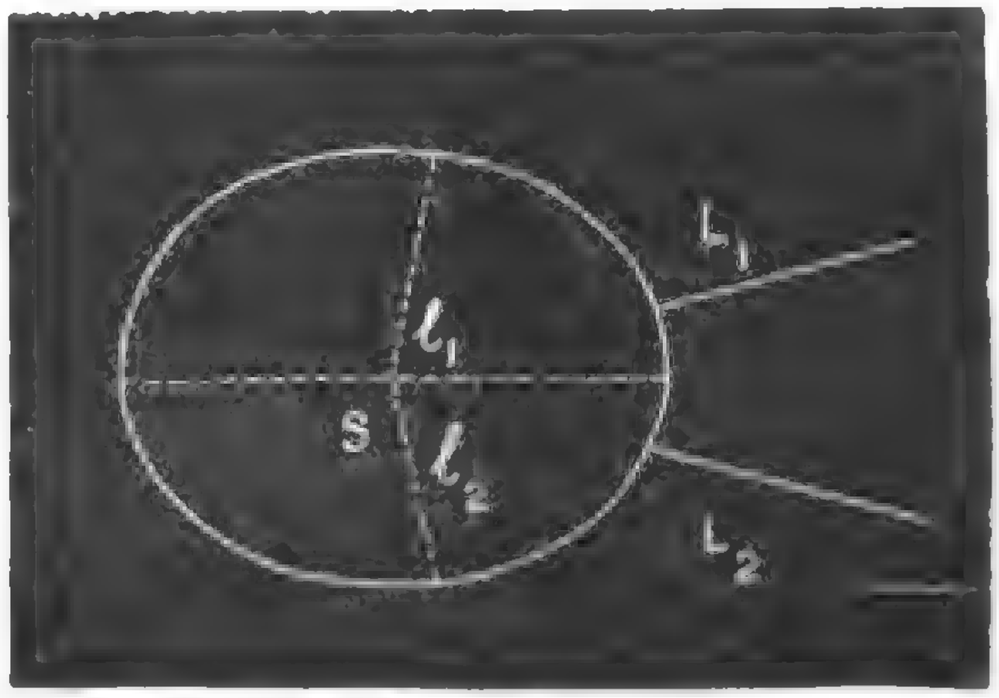


Fig. 1.

The apparent image Sl_1, whose deviation is maximum, is normal to the perspective line L_2 when deviation is minimum. And Sl_2 is normal to L_1.

According to formula $p=\dfrac{P_1-s-t}{P_2-s-t}$ we have

$$(13)\begin{cases} tg\ \delta_1=\dfrac{P_2-P_1}{2\sqrt{(s+t-P_1)(s+t-P_2)}} \\ tg\ x_1=\sqrt{\dfrac{s+t-P_2}{s+t-P_1}} \\ tg\ y_1=\sqrt{\dfrac{s+t-P_1}{s+t-P_2}} \end{cases}$$

These formulas show that:

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

1° The maximum δ_1 is the greater as the amount of astigmatism is greater.

2° The inclination x_1, for which δ is maximum is less than 45°.

3° The inclination y_1, for which δ is maximum is greater than 45°.

Instead of rotating the line L in the positive direction, we can rotate *the lens* in the *inverse direction* about its principal axis. Then, line L being fixed, the apparent image seems to have a movement of its own. It begins by moving in the *positive direction*, then in the negative one and so on. This movement can be likened to that of a pendulum-rod. It is an *oscillatory movement*. The angle between the two extreme positions is equal to $2\delta_1$.

We have supposed as yet that the apparent image is virtual in all meridians. If it is real in all meridians, we can see on figs. (3) and (4) that the image is at first following the inverse prolongation of the line and then in advance. There is still an oscillatory movement. In rotating the lens in the *inverse direction*, the image begins by moving in the same inverse direction and then in the positive one and so on. The formulas are the following ones:

$$(14)\quad \begin{cases} tg\ x_2 = \sqrt{\dfrac{P_2 - s - t}{P_1 - s - t}} \\ tg\ y_2 = \sqrt{\dfrac{P_1 - s - t}{P_2 - s - t}} \\ tg\ \delta_2 = \dfrac{P_2 - P_1}{2\sqrt{(P_1 - s - t)(P_2 - s - t)}} \end{cases}$$

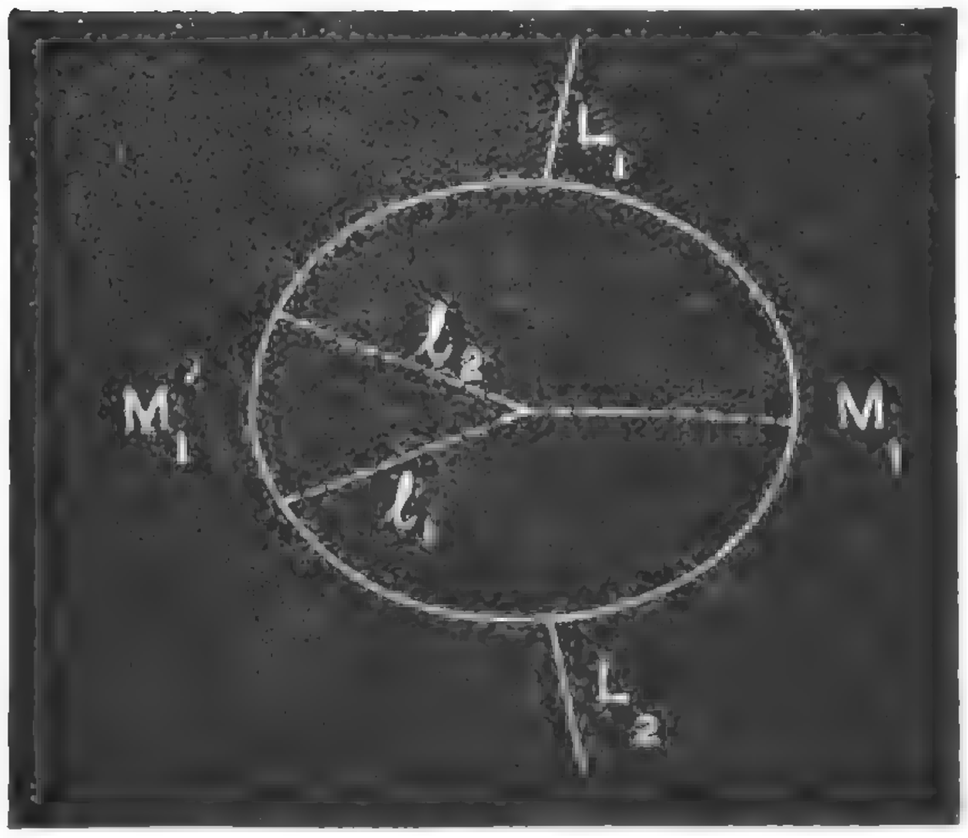


Fig. 2.

The image Sl_2 is still normal to the perspective L_1 and Sl_1 to L_2, but x_2 is greater than 45° and y_2 is less than 45°.

When the image is a mixed one, that is to say, virtual in M_1 and real in M_2, we must refer to figs. (5), (6), (7), (8).

When $x = 0°$, the image coincides with perspective L.

When x increases, the image moves in the opposite direction and δ is always increasing. Its value reaches 180° when $x = 90°$ and 360° when $x = 180°$. There is no maximum nor minimum. The movement is a *continued* one.

If, instead of rotating the line L in the positive direction, we rotate the *lens* in the negative direction, the apparent image rotates always in the negative direction and makes a complete revolution while the lens makes half of it.

From this, we may draw the following conclusions:

1° If, on rotating the lens, the image gets an oscillatory movement, it is virtual or real in all meridians.

2° When it is virtual, the meridian of least power is that from which the movement of the image is opposite to the lens movement.

3° When it is real, the meridian of least power is that from which the movement of the image is in the same direction as the lens movement.

4° If the image gets a continued movement, this is in the same direction as the lens movement. The meridian of least power is that which gives a virtual and erected image.

This last case of a mixed image gives a curious appearance because the lines nearly parallel to the first meridian are erected and those nearly parallel to the second meridian are inverted. This can be found only in images formed by mirrors and not by thin spheric lenses. Here are two examples:

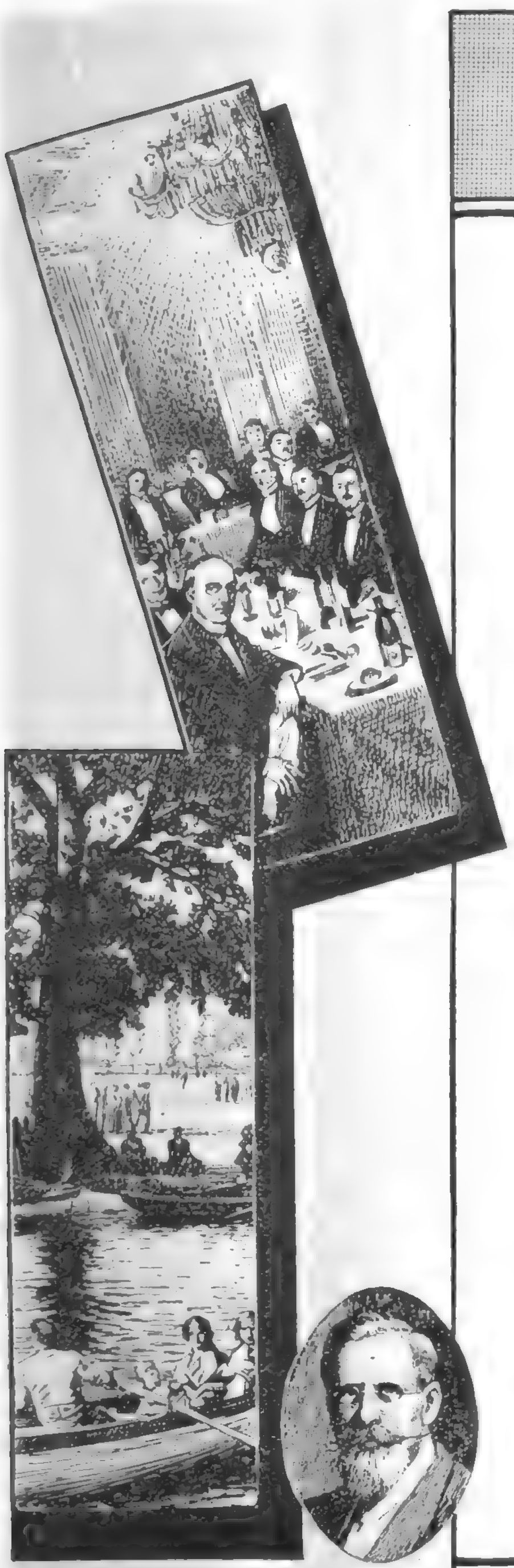
1° Put the present sketch at 50^{cm} and interpose midway a + 6^d sph. $\frown$ 90° cyl. + 12^d



Fig. 3.

ens. You will observe a deformed image with nose towards right side. By parallax method you can verify that the vertical lines of the

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



The late Sir Wm. Crookes, O.M., F.R.S., to whose researches was largely due the evolution of Chance's 'Crookes' Glass.

The All Seasonal Need for

Chance's 'CROOKES' Glass

It requires little thought to point the need for Chance's "Crookes" Glass in summer, but its winter desirability is not quite so obvious.

Nevertheless, the winter need is both great and widespread. All who read much by artificial light, all who sew, all who concentrate their attention on any bright object or material, can be well advised to use Chance's "Crookes" Glass. We received last winter numerous letters from men and women who had found this glass wonderful in eliminating nervous headaches.

The coming winter need bring no falling-off in the demand for Chance's "Crookes" Glass. Steady publicity will be found just as fruitful now as during the hot months.

CHANCE BROS. & Co., Ltd.,

Glass Works,

SMETHWICK, BIRMINGHAM.

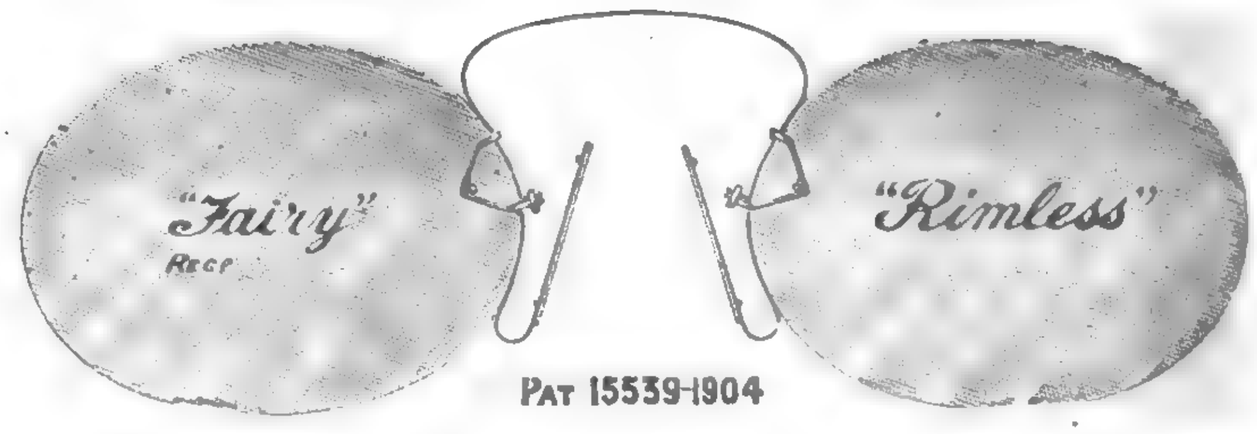
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Phone:—City 3225 (3 lines) *Telegrams:—Bulford, BARB. London.*

PATENT "FAIRY" REG^D MOUNTINGS.

Have taken a distinctive place in the World of Eyeglasses
SOLELY UPON MERITS.



By the Patent Method of Attachment, they, as it were, make the two Lenses and Fitting One Piece, giving that Rigidity upon the face which makes them a pleasure to wear.

Royalty wear them; people of note wear them, and it should interest you to sell them as we make them in Gold only.



There are Points of Refinement in the design rendered possible only by the Patent Method of Attachment to the Lenses.

Made by the firm whose Reputation for Prescription Work is:—*"Second to None."*

NEWBOLD & BULFORD, *Prescription House,*
GOSWELL ROAD, LONDON,
E.C. 1

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

image are behind the lens and the horizontal ones before it.

2° Look through a 90° cyl. + 6^{d} lens at a person standing at several yards and saluting with the right hand. You will see him or her saluting with the left hand, provided the lens lies at about 35^{cm} from your eye.

The mixed image of a straight line becomes inverted when it stands normal to it. This occurs when $tg\ \delta$ is infinite. According to formula (6 bis), we have then

$$tg\ x_s = \pm \sqrt{\frac{P_2 - s - t}{P_1 - s - t}}$$

The image is inverted when x is between x_s and $180 - x_s$, and erected when x is

$$< x_s \text{ or } > 180 - x_s.$$

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

Early Sight Testing.

Sir,—In connection with your Editorial Note, "Optical History," and the letter of "Fair-play" in your issue of October 14th, I wonder if you would consider a recollection of mine of any interest to your present readers.

I well remember the gentleman who traded under the name of T. Henri making his start in business on his own account, and from recollection I should place the date as during the year 1882. At the time I was employed in the capacity of "general utility boy" by the late Mons. Aristide Fournet, who was then in business at premises numbered 31, Ludgate Hill, very near the site of Messrs. Dollond's present establishment.

The shop was a deep one, the back portion being partitioned off from the shop proper, forming a quite private and very well equipped sight-testing room. This room was lit in the day time by a skylight, blinds were so arranged that it could be quite easily darkened. The method of sight-testing then used by Mons. A. Fournet was mainly subjective; he was, however, well versed in the use of the simple ophthalmoscope of Liebriech, and frequently resorted to it in cases of difficulty. I am confident that this room existed quite twelve months before Mr. T. Henri made his start.

I do not think anyone can rightly claim to be the originator of modern sight-testing methods; to me it seems to have been a process of evolution. In this connection the claims of Mr. Ackland of the firm of Messrs. Horne and Thornthwaite, of Mr. John Browning, first President of the B.O.A., of Mr. Ellis of the firm of Messrs. Marratt and Ellis, and of a gentleman who occupied premises on the south side of the Strand (nearly opposite Messrs. Horne and Thornthwaite) whose name I cannot recollect, but who I know was able to test for and correct astigmatism, are entitled to consideration as pioneers.

Interesting information concerning this subject and of these gentlemen, could be given by my good friends, Mr. George Culver and Mr. G. W. Bayliss—no doubt others also—could you, Mr. Editor, induce them to favour you and your readers with some of their recollections; the name of Mr. Robert Sutcliffe also suggests itself to me as one who could throw light on those early days, especially as regards the Provinces.

JAMES LUCKING.

5 and 7, Corporation Street, Birmingham.

Sir,—It may interest your readers to learn that the pioneer of the present day system of sight-testing in a separate room equipped for the purpose, was Dr. Ackland who for many years attended to all questions relating to sight-testing and spectacle fitting at the business premises of Messrs. Horne & Thornthwaite, opticians, of the Strand, W.C.

The next individual to open a sight-testing room in connection with his optical business was a Mr. Henry Laurence of the Poultry, E.C.

Both these firms have long since disappeared, but they certainly flourished *before* the advent of the "Mr. T. Henri" referred to by your correspondent.

I may add that the statement that Mr. T. Henri taught Mr. Aitchison his business is one which I cannot accept.

Dr. Ackland and Mr. Henry Laurence may be regarded as having begun sight-testing in a separate room about 45 years ago, or possibly more. (My own experience dates back nearly forty years.)

FREDERICK W. BATEMAN.

55, Berners Street, W.1.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

British Manufacturers' Prices.

Sir,—I wonder if some of your readers realise the imposition about to be inflicted on the retailers with regard to British lenses.

I am given to understand that prices are shortly to be advanced on account of the tax on imported lenses.

There is no justification for the increase. The cost of living is certainly not increasing, neither are wages; yet without apparent cause, except the one mentioned, we are to pay more.

Cannot the N.A.O. take up this matter? Most of its members are retail opticians.

Otherwise I can envision a "Retailers Association," formed for their own protection against the "Ring."

LANCASTRIAN.

*** In view of the importance of this matter, we have referred the question to the largest firm of ophthalmic lens manufacturers in this country, the United Kingdom Optical Company, Mill Hill, who inform us we can state categorically that, notwithstanding the Key Industries Act, and in spite of present adverse circumstances, they have not, and never have had, any intention of raising the prices of lenses of their manufacture.

The Curriculum of the Optologist. What Subjects are Really Necessary?

Sir,—After reading the very interesting address on Diplopia by Dr. Fergus in last week's *Optician*, I am venturing to offer a few comments and criticisms thereon. Dr. Fergus states that no one without a good training in medicine, pathology, surgery, bacteriology, and physiology—that is he or she must be a qualified medical practitioner—should undertake ophthalmic practice.

He further states that general legislation would never step in and prevent an optologist from fitting a person with a pair of spectacles, whose sight was failing. (Before proceeding further, I understand ophthalmic practice to mean that practice undertaken by our leading non-medical optometrists, as these remarks are addressed to a society consisting of qualified and non-qualified sight-testing opticians).

I think in face of such a declaration from such an authority as Dr. Fergus it behoves sight-testing opticians to do one of two things.

(i) To abandon sight-testing.

(ii) To go the whole length of a proper training.

For my own part I heartily agree with the latter, but must beg to disagree with Dr. Fergus on his declaration of the scope of the training necessary. A training in pathology of the eye and special general pathology, general physiology and special anatomy and physiology of the eye, and perhaps a little theoretical knowledge of ophthalmic surgery is necessary in addition to the knowledge required by the S.M.C. and B.O.A.

Surgery and medicine as required for the general practitioner is absolutely not required by the optologist; further, if medicine and surgery are to be included it involves more subjects still, such as chemistry, pharmacy, biology, etc. The optologist can easily transfer his surgical and medical clients to the medical man and surgeon (as he does).

We must take a leaf out of the book of our friends of U.S.A. They have already added general physiology, blood pressure taking, hygiene, etc., to their curriculum.

On no account must we accept any Charter or Registration of Opticians' Bill *that is going to curtail or limit the subjects of our curriculum.* Let the optologist of the future develop into an independent specialist working in conjunction with the ophthalmic surgeon, and medical man, and not a spectacle frame measurer and medical man's "doormat."

There is plenty of scope for the ophthalmic surgeon and the medical man. Let him hand over his refraction to the optician and his dispensing to the chemist, and not add these things to his already over-burdened medical and surgical curriculum. Let him refrain from referring to men who are not medically and surgically qualified, "as no better than the venereal quack."

(Blessed word that "quack," like Mesopotamia, to hurl at people outside one's special circle).

Let me here state that a good deal of scientific medical discoveries and knowledge have been acquired by non-medical men, and a good deal of research on these lines is even now conducted by those non-qualified medically and surgically, and I have no hesitation in stating that progress in sight-testing will in the future be from the researches of the non-medical refractionist, as in America to-day, but don't try and persuade us that a medical knowledge of nettlerash and ringworm, and the surgery of fractures and appendicitis is necessary to make a competent optologist. The position of the optometrist of to-day is on a solid foundation—thanks to present and past medical and non-medical refractionists, and also above all to the voluntary schemes of examination and training of the British Optical Association and Spectaclemakers Company, opticians read, mark and inwardly digest Dr. Fergus' address, and let your motto be "Advance Optologists."

HENRY J. MORGAN.

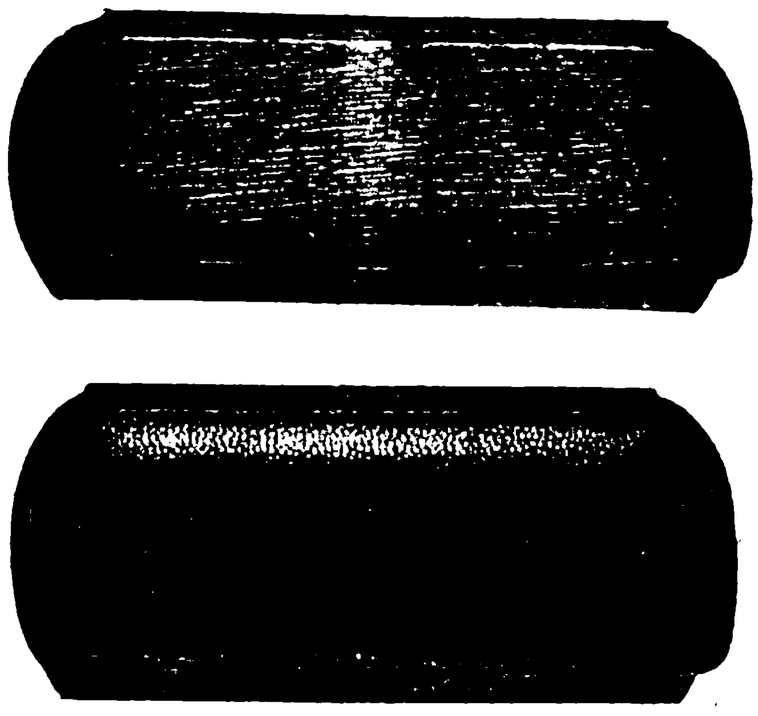
Somersham, Huntingdonshire.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

"WERTEX"

WILLMOTTS'

LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.



"WERTEX" Cases are Supplied in 4 Sizes 3 Grains 3 Colours.

Particulars from Your Dealer or direct from the Manufacturers.

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

ENGLAND.

C2

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Consider Everything and Judge.

AN opinion based on insufficient data is valueless. Consider the **L.O.C.** Rx Service offered to Sight-Testing Opticians in this country. The facts are :—

(a) Our equipment is the latest of its kind. Appliances are often scrapped for those of newer pattern.

(b) Our Staff is highly skilled; at one with us in rendering efficient service, and absolutely trustworthy.

(c) Our organisation is so arranged as to facilitate work at high speed.

Special rush jobs are in hand five minutes after receipt and, provided the work involved is reasonable, sent back by return of post.

(d) Our prices are the lowest consistent with sound workmanship.

These are the facts on which we solicit your patronage. Examine them and decide as to the destination of your next Rx order.

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere. Paris. France.

Also at—2, Str-Bursei, Bucharest, Roumania.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

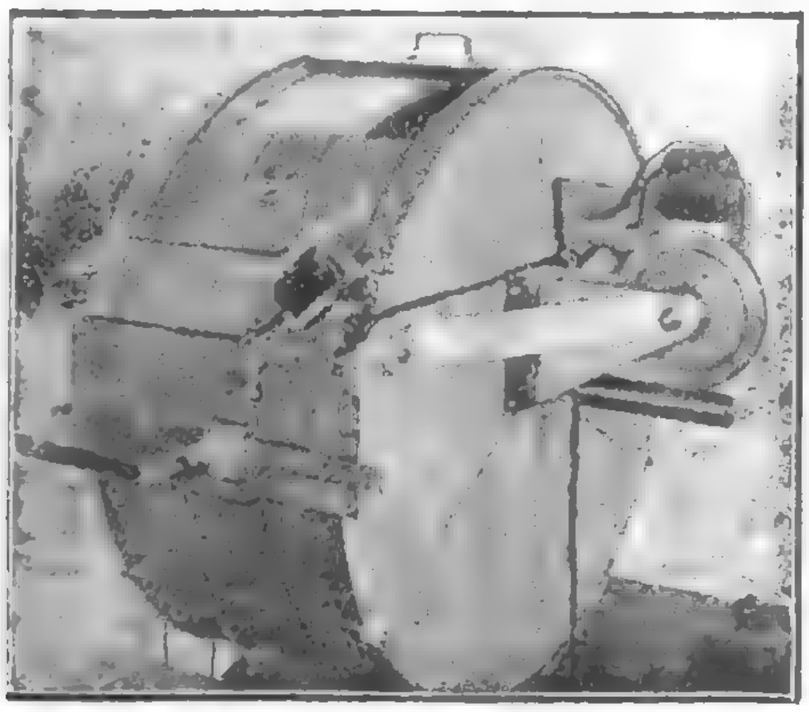
A CYCLOGRAPHIC CAMERA.

A remarkable development in modern photography is centered in the cyclographic camera recently devised and perfected by Dr. T. E. Eckhardt and his assistants at the Washington laboratories of the National Bureau of Standards. This special camera is a masterpiece of photographic skill, as it takes pictures of things travelling at such excessive velocities that no other camera is qualified to get a picture of their flight.

The cyclographic camera is of great scientific and research value for making sound photographs, for making pictures of the almost imperceptible vibrations of mechanical devices and for reproducing the paths of projectiles. It renders possible the study and potential solution of scientific secrets which heretofore have been unsolvable enigmas.

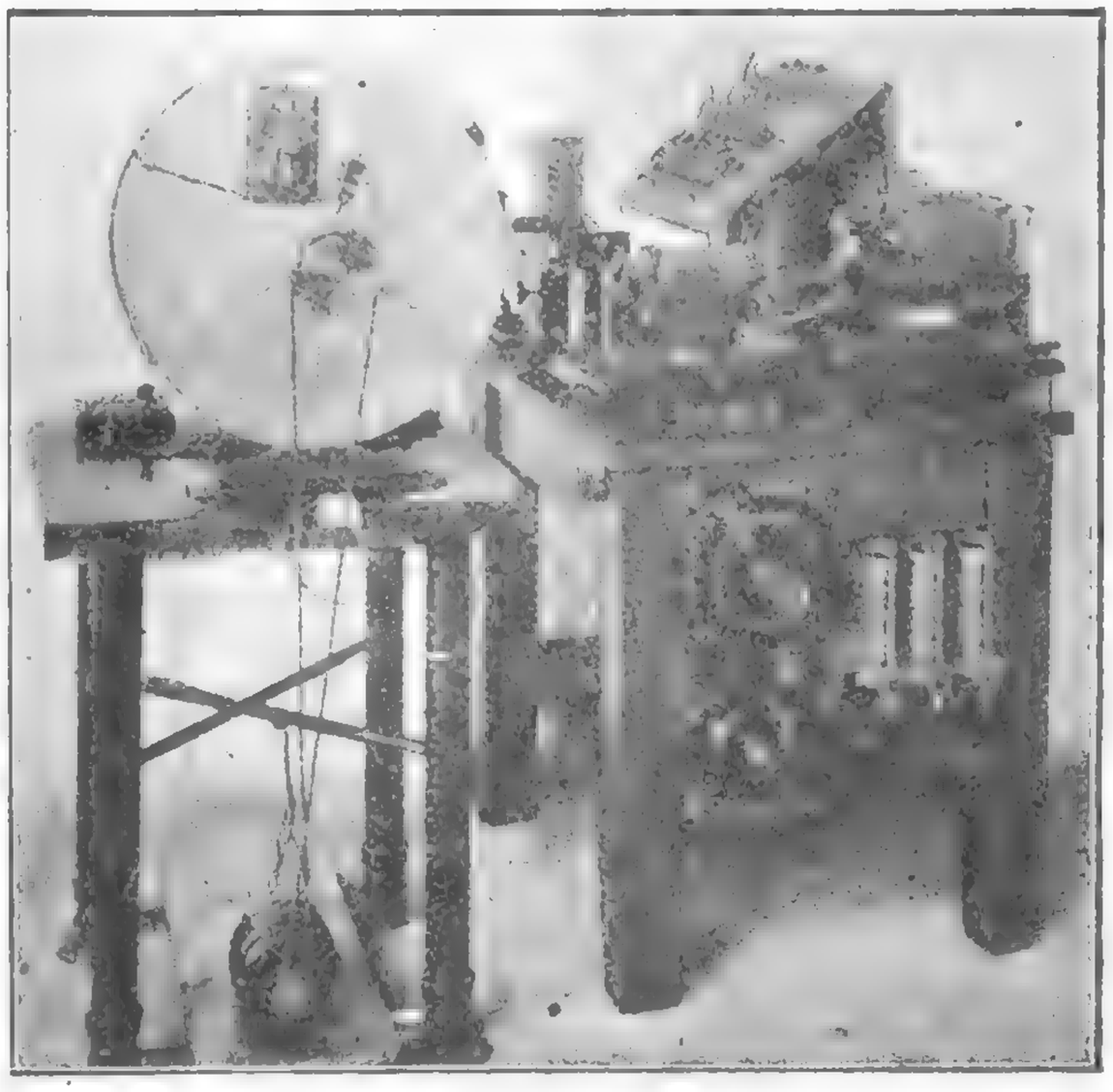
The cyclographic camera is a cylindrical contrivance with a special flywheel and drum so devised that the film rolled or unrolled over this drum may be held taut at all times. The camera makes ten revolutions a second and the length of the film used is five feet. This means that the camera is capacitated to make fifty feet of exposure a second.

To provide this amount of film on the drum would involve the use of a very cumbersome camera. The Bureau of Standards experts



The Cyclographic Camera, showing the Worm which causes the Spiral Motion and the Relay Magnet which Operates the Shutter.

have solved this problem by equipping the drum with a special worm appliance which permits of spiralling the film in taking the picture by alternately moving the drum uniformly back and forth. This means that the normal five feet of film which the four-inch-wide camera can carry, can be so operated as



The Cyclographic Camera taking Pictures of Rapid Vibrations developed by an Electric Oscillograph.

to accommodate forty feet of actual picture by limiting the exposure to one-half inch per revolution and spiralling the film eight times in making that amount of exposure.

The worm which causes the spiral motion of the film is operated by a very sensitive relay magnet which is also connected directly with the shutter in such a manner that the shutter opens and begins to take the picture as soon as the worm and drum become active and start the spiral movement. A small electric motor is used to operate the drum cylinder and to unroll the film at a uniform speed.

Ordinarily, as the motor operates the drum, the worm idles at leisure. When the spiral movement of the drum is desired, this worm is energised by means of the relay magnet.

In order to make a sound photograph with the new camera, it is necessary to provide some reflecting surface which will indicate the variations in the air pressure which prevail. Small mirror attachments are employed for this purpose.

In mechanical shops and factories, the new camera will be invaluable where trouble or breakdowns occur with vibrating machinery. The new camera differs from the average

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

motion picture camera inasmuch as its film is moving continuously during exposure, while the ordinary kinematograph film is made by intervals.

An idea of the scientific importance of the cyclographic photographs of rapidly moving bodies may be gained, says Mr. G. H. Dally, who describes it in 'Popular Science Siftings,' from the fact that time can be measured to approximately one-millionth of a second on the exposed film.

It may be mentioned that the first cyclographic camera was described in *The Optician* in 1892. References may be found in the bibliography appended to Hopwood's "Living Pictures," edited by Mr. R. B. Foster, B.Sc., and published by the Hatton Press, Ltd.

A PLAIN TALK ON THE EXCHANGE PROBLEM.

By T. E. GREGORY, B.Sc. (Econ.) Lond., Cassel Reader in Commerce in the University of London, in the 'Daily Mail.'

At the beginning of last week one paper pound bought in the London exchange market some 450 German marks.

By Monday afternoon of this week the number of marks so purchasable had risen to 750.

Similarly the number of Polish marks (nominally worth the same as the German mark) to be bought with one paper pound was some 18,000; by yesterday, the number which could be bought had fallen to 14,000.

In a week there was thus a fluctuation of 300 points in German marks and of 3-4,000 in Polish marks, and these fluctuations were in opposite directions.

German marks became that much cheaper, Polish marks that much dearer. A German mark, which is now worth only about one farthing, was worth a shilling in July, 1914, and was still worth threepence at the armistice.

The exchange problem is thus a twofold one; firstly, a great fall in the value of some currencies in terms of other currencies, and, secondly, a great instability in these values.

But we must now go on to ask the question, *Why do these problems exist?*

The explanation is quite simple. Before the war the commercial nations all used the same currency; to-day, they are using different, "nationalised" currencies, instead of an international currency.

Broadly speaking, before the war all the great trading nations based their currencies on gold, and not only was this so but this gold, which was the basis of the currency, *was freely meltable and exportable.*

The result of this simple fact was very great. If the same commodity is worth more in one place than in another; it will be moved from the place where it is cheap to the place where it is dear, provided that the difference in the value in the two places is greater than the cost of transport from the cheap to the dear area.

But what is the value of gold coin? The value of gold coin is the amount of other things it will buy.

Therefore, if an ounce of gold turned into coin will buy more in one place than in another there will at once be set up two movements. There will be a movement of gold from the place where it buys less to the place where it buys more goods and a movement of goods from the places where they buy less gold to the places where they buy more gold.

Where gold or other coins buy little, prices are said to be high; where they buy much, prices are said to be low.

Therefore, we may say that before the war the result of the fact that gold and goods were both moved about was that the price level of the world, expressed in terms of gold coin, tended to be the same in all places. Gold moved from high-priced countries to low-priced countries, just as goods moved from low-priced countries to high-priced ones.

Gold and goods alike moved to the areas where they obtained as much as possible.

It followed that the price level all over the gold-using world tended to be the same, and that the value of the gold currencies tended to be the same. But this is the same thing as saying that the rates of exchange of the various currencies tended to be stable. For the rates of exchange simply expressed the ratio between the gold-contents of the principal coins. That is, they were conversion weights and nothing more.

The Present Position.

Now what is the position to-day? In most countries there is no gold coinage at all, and even when there is the gold coin is no longer freely meltable and exportable. In place of the international money-medium, gold, there are local paper currencies.

Now if one of these paper currencies enables people to obtain more goods in exchange than another, it is clear that the first will be more valuable than the second in proportion to its greater purchasing power; in other words, the ratio of exchanges between paper currencies will be based on their respec-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Seven Styles

now made in

"OCENTRIC" EYEGLASSES

BRITISH MADE.



A Distinctive Model for Each Individual Taste.

RIMLESS MOUNTS & FRAMES. G.F. & SOLID GOLD.

0	series	Short Plaquets Regular pattern
100	„	Normal Plaquets Regular Pattern
200	„	Long Plaquets Regular Pattern
300	„	For Centrally Drilled Lenses *(BENT UP PLAQUET ENDS.)*
400	„	For Centrally Drilled Lenses *(CLAMPS ATTACHED BY SHORT BRACKET.)*
700	„	For Centrally Drilled Lenses *(SWAN NECK BRACKETS.)*
800	„	Regular Pattern with Double Straps

SAMPLES and PRICES WILLINGLY ON APPLICATION.

The British Ocentric Optical Co., Ltd.,

Wholesale and Manufacturing Opticians,

12 & 13, EAGLE STREET, SOUTHAMPTON ROW,

LONDON, W.C. 1

Telegrams—Ocentricco, Westcent, London. *'Phone—Holborn 560*

Cables—Ocentricco, London.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

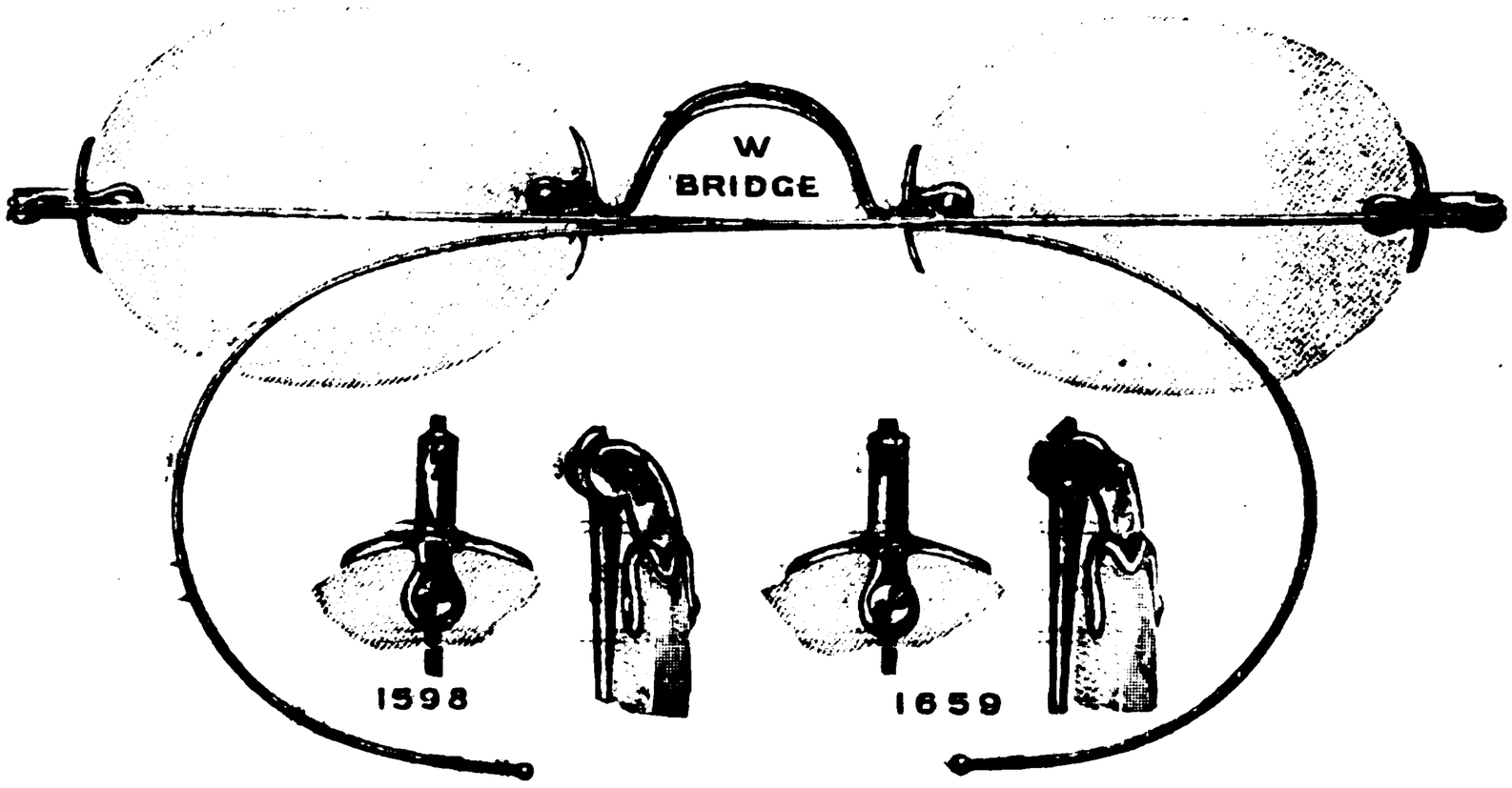
QUALITY FIRST

DUPAUL, YOUNG OPTICAL CO.,

ESTABLISHED 1888.

SOUTHBRIDGE, MASS., U.S.A.

Manufacture only Guaranteed Quality and Best Finish Gold-Filled and White Metal Spectacles, Eyeglass Frames, Astigs, Mountings and Materials.



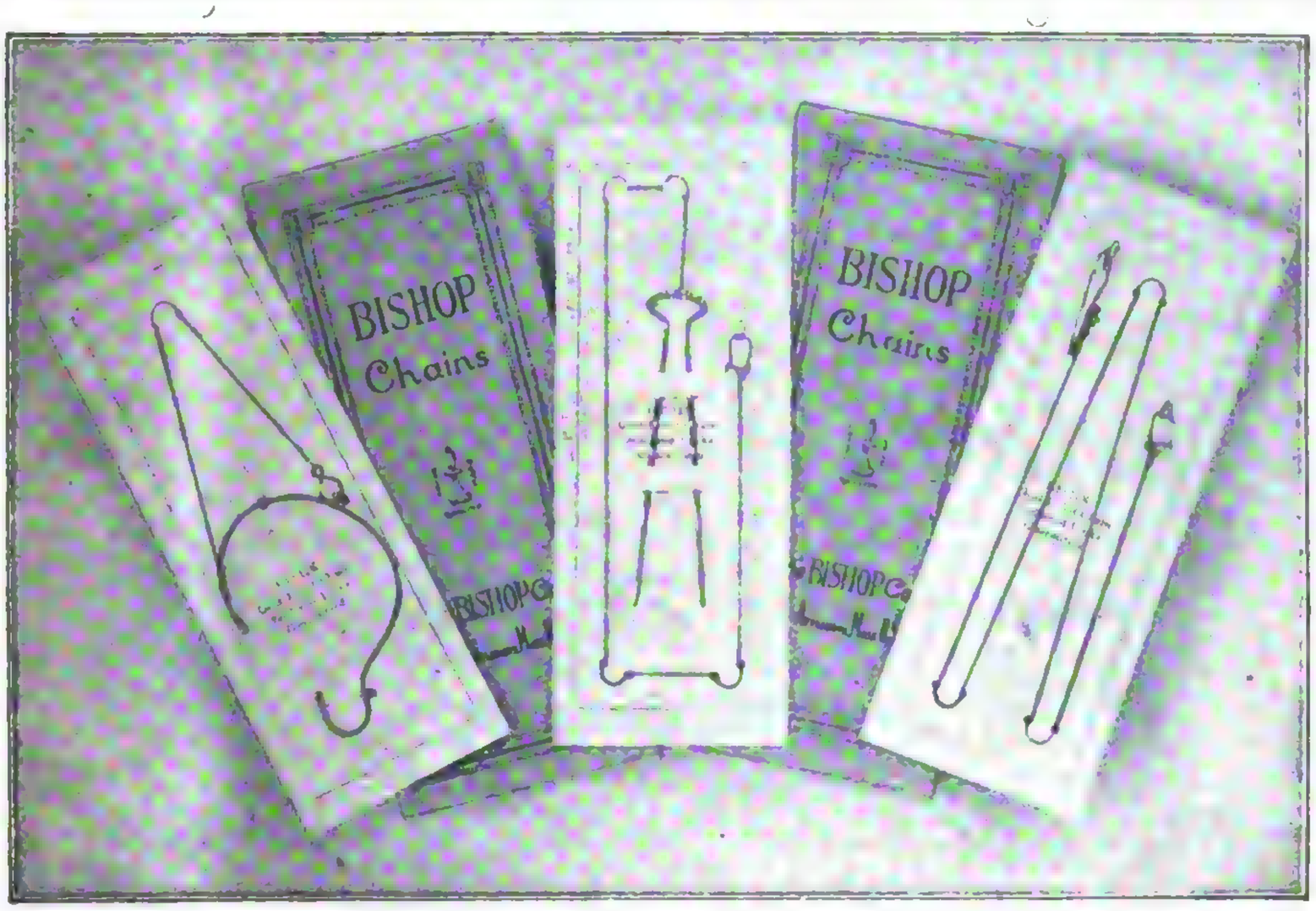
To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. Telephone: CENTRAL 7241

Digitized by Google

Original from THE OHIO STATE UNIVERSITY





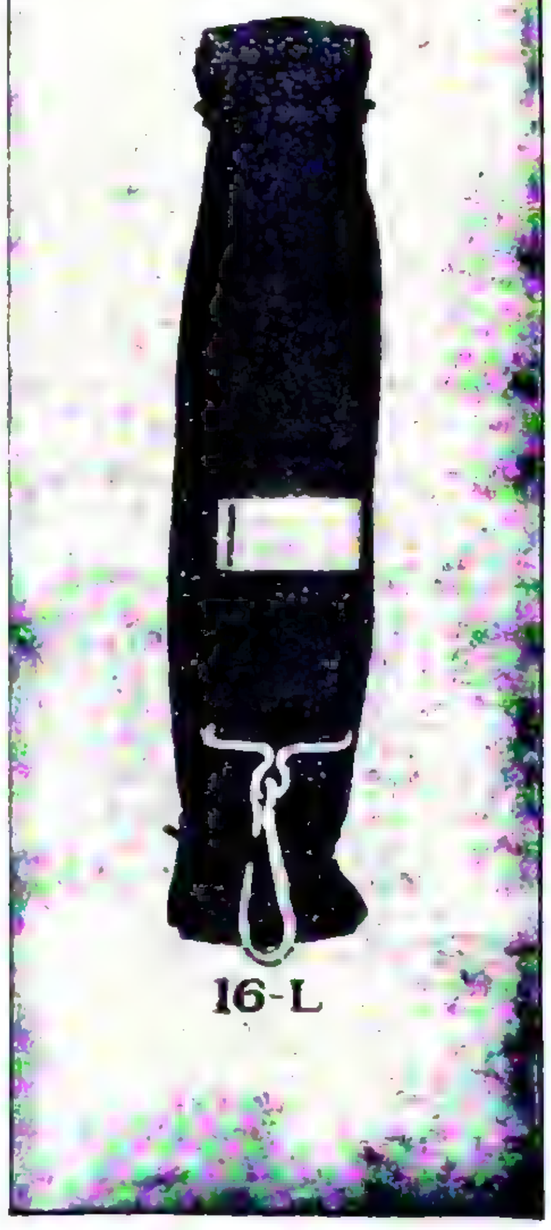
BISHOP CHAINS

should be your standard of Quality,
in solid Gold and Gold Filled,

BISHOP SILK EYEGLASS CORDS AND MONOCLE RIBBONS.

With Gold Filled, Silver or Gun Metal snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.



To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

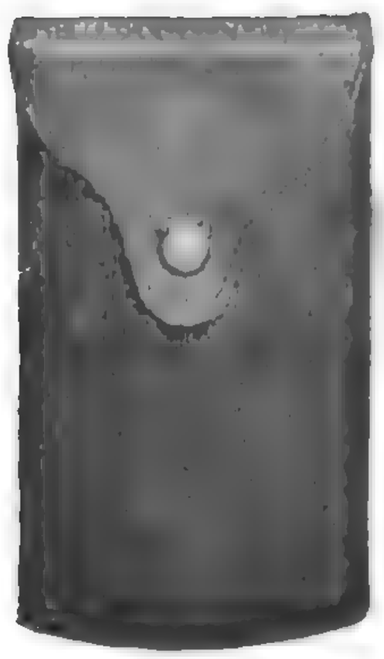
Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Shur-on Glasses

Retailers!

Consider This For Bigger, Better Business——



Want This?

It's a "Quality Beyond Question" Shur-on goggle case—a *flexible* one! We're so enthusiastic about it that we'd like to have you get one, without charge, to prove for yourself wherein it surpasses any goggle case you've ever seen. Just write for it, mentioning the name of your wholesaler.

When it becomes fixed in the minds of retailers that the name "Shur-on" on an optical product means "Quality Beyond Question"—and has meant that ever since 1864—then, there will be more—much more satisfaction, measured in terms of comfort, becomingness and wearability, accompanying every optical sale.

Wise retailers are quick to realise the potential sales and good will value attached to a product of known and unvarying high quality.

If your wholesaler cannot supply you with Shur-on products, send us his name.

Shur-on Optical Co.,
Rochester, N.Y. U.S.A.

Quality Beyond Question Since 1864

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

tive purchasing powers. This gives one the "purchasing power parity"—a term invented by the celebrated Swedish economist, Prof. Cassel.

The rate of exchange ought to express the relative amount which at any moment can be obtained by the use of the currencies as instruments of purchase. If £1 can buy 240 times as much as a mark, then 1 mark should be worth one penny.

Complexities.

But now come two horrible complications.

In the first place, owing to the constant increase of the number of mark pieces the rate of exchange is constantly altering. Increase of marks means higher prices in Germany, and unless *our prices rise simultaneously, the rate of exchange between pounds and marks is bound to alter.*

But quite apart from this, *the actual value of German marks in terms of pounds is less than it ought to be when the purchasing power of marks and pounds is compared.* That is (*using illustrative figures only*), while the internal price levels in this country and Germany would justify a rate of exchange of 1 mark equal, say, to three farthings, the actual rate is only 1 mark equal to less than one halfpenny.

Of course, there must be a reason for this "under-valuation of the mark," as the economists call it, but it is difficult to find the right reason.

My own explanation is this. If people in this and other countries expect that the future purchasing power of the mark is going to fall —if, that is, they think that more marks will be printed and German prices will rise, unfavourably affecting the rate of exchange—they will only accept marks in exchange for goods now at rates which will give them a margin of safety in the future. That is, the anticipated effect of further price rises affects the present position of marks in the world market to-day.

Whether my explanation is the right one or not, there is no doubt what the result of this under-valuation is. Here we come to the question, how does the present position affect you? The answer is not difficult.

Firstly, Great Britain is dependent on over-seas trade for its very existence. If the exchange market is disorganised, it means that over-seas trade is more difficult to conduct, and consequently that there is more unemployment and industrial stagnation. Fluctuations on the scale of the last few days make trade almost impossible.

The man who happens to buy British goods at a moment when his own currency is suddenly worth more than usual may make a fortune, but if he should happen to buy when his own currency is falling in value he is ruined. Every increase in the stability of the exchanges adds to the chances of business, and every increase in the instability of exchange rates adds to the dislocation of business. It does not matter at what point the exchange is stabilised, provided that it *is* stabilised. This gives us the answer to my first question.

Secondly, so long as some currencies are under-valued in foreign markets the producers who sell goods and are paid in these currencies have an advantage, *so long as they are not manufacturing from raw materials bought from abroad.* If German marks are under-valued, then German producers have an advantage, so long as they do not have to buy raw materials which they have to pay for in what is to them a foreign money. Even in this case they may gain on their wages bill.

But under-valuation depends on the fear of further inflation—that is, increase of currency —and the steady fall in the value of marks and Austrian crowns, Polish marks, and the like also rests on increasing the supply of these currencies.

It will be seen, therefore, that the key to the solution of both difficulties lies in the same direction—the cessation of further note issues and the attainment of a stable basis. But though the solution lies in this direction, it is not within the power of the economist to determine the political conditions which will enable this stabilisation to be attained. Certain it is that unemployment in this country cannot be solved without a settlement of the exchange problems of which I have given an outline here.

The Northampton Institute Lectures.

As announced in these columns last week, an important series of illustrated lectures on optics is to be given at the Northampton Institute; and the attendance fee for all six lectures is only 2s. 6d. or single admission 9d. The first two addresses, on "The Eye and Man's Work in Assisting It," will be delivered at 7.15 p.m. on October 26th, and November 2nd, by Professor F. J. Cheshire, C.B.E., A.R.C.Sc., F.Inst.P.

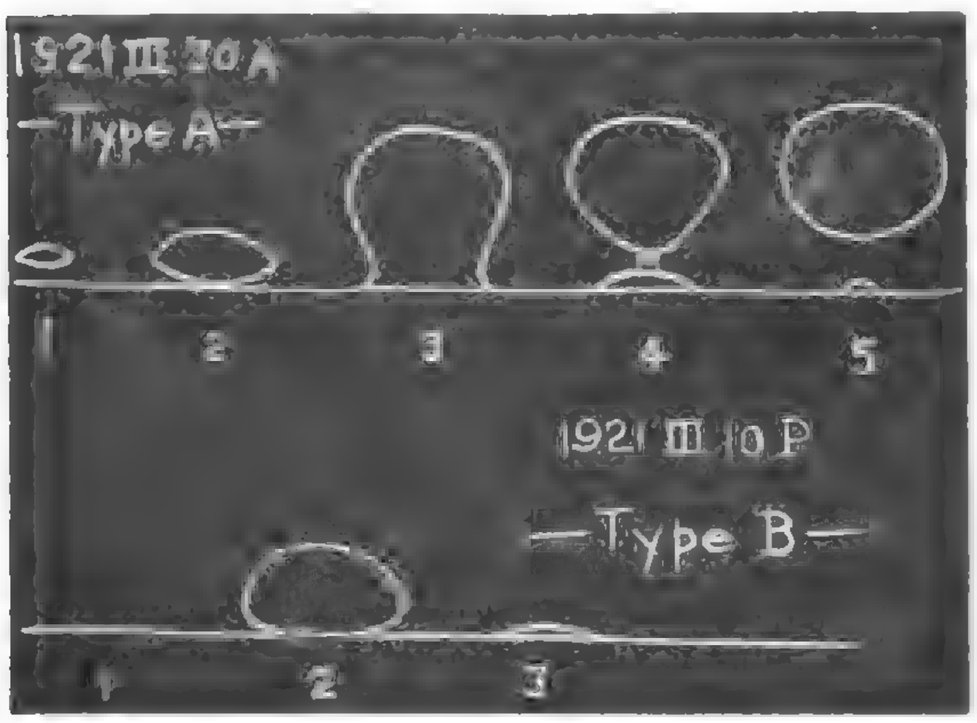
Matter intended for the current weeks' "Optician" must reach this office on the Tuesday morning preceding publication.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Duration of Sunrise and Sunset.

My attention having been accidentally directed to this matter, says Dr. Willard J. Fisher, in 'Nature,' I have made observations for the purpose of comparing the observed duration of sunrise and sunset with the duration computed from geographical position and 'Nautical Almanac' data, and have now seventy-nine complete observations, made mostly with marine horizons on Manilla Bay, the China Sea, the open Pacific, Vineyard Sound, and Buzzard's Bay, with a few made with land horizons. The view-points have been from sea-beach to 1512 meters elevation.

There seem to be two types of marine sunrise and sunset; one, type A, about twice as



frequent as the other and accompanied by horizon mirage. The diagrams accompanying this letter, sketched from photographs obtained at Woods Hole, show the characteristics of the two types, which are described with historical details in 'Popular Astronomy' (vol. 29, pp. 251, May, 1921), and, with theory and methods used, in the "Philippine Journal of Science' (vol. 17, pp. 607-14, 1920).

The time observations, made with field-glass or telescope, stop-watch, and ordinary watch, show that with type A there is, on the whole, a slight excess of observed duration over computed, amounting for forty-four cases to 0.55 per cent.; a few cases give small deficiences. This may be, perhaps, explained by atmospheric dispersion. Type B, however, always gives excess, sometimes remarkably large, even 2 min., or 68 per cent., with an average excess for twenty-two cases of 12.3 per cent., which is difficult to explain.

Records of duration of sunrise and sunset are almost non-existent; a careful search, with inquiries of several prominent astronomers, has failed to produce more than about half a dozen, mostly made by Le Gentil at Pondichéry in 1769 while on his transit of Venus expedition. While he made no such use of them, on computing they give results in agreement with the above. It would seem, perhaps, worth while for others to take the matter up and record and publish at *least* date and hour, geographical position, nature of horizon, duration, and type or form of disc. The horizon should be quite level or distant if at all irregular. Naturally, the best horizon is that of the sea or a large lake; but I have reason to believe that the results of observing with a distant level land horizon might be sometimes quite extraordinary.

While the sun is the source of light in such observations, and the 'Nautical Almanac' and four-place logarithms have to be used in the computing, the subject is not astronomical, but meteorological, and, I believe has to do with temperature distribution in the atmosphere. We have here one of those residual phenomena, the study of which may lead to the discovery of interesting facts and which can be forwarded by amateur observers, the more and the more widely scattered the better.

The National Association of Opticians.

A meeting of the Council of the N.A.O. was held in Manchester on September 28th. There were present Messrs. A. Hershberg, J. W. S. Green, R. Chalmers, H. W. Daykin, J. W. Oberle, L. Moreton Parry, D. R. Jones, T. Beardsall and E. Moevius. An apology for inability to attend was received from Mr. T. S. Baird.

The President, Mr. A. Hershberg, was in the chair. The meeting being declared open, the minutes of the previous Council Meeting was read and confirmed.

The correspondence, although heavy, and in connection with the private affairs of members mainly, yet contained information of importance with reference to the Optical Scheme of the National Insurance Beneficent Society, on which after considerable discussion a noteworthy decision was come to, which may have a far reaching effect on the future of the N.A.O. A small committee of the Council was appointed to carry out the terms of the resolution.

After various accounts had been passed for payment, the Hon. Treasurer, Mr. H. W. Daykin made his usual financial statement which afforded proof that the N.A.O. was still making steady progress, both financially and numerically.

It was unanimously resolved that a donation of one guinea be given to the funds of

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

A FEW INTERESTING REMARKS REGARDING

RX WORK

1918 ← 1921

April 1921.

"Your work, I must say, has given every satisfaction, both as regards quality and despatch, as I have mentioned more than once I believe."

April 1921.

"I am very pleased with the three jobs received this morning, they appear to be very well done."

April 1921.

"Many thanks for the work received this morning which was quite satisfactory."

March 1921.

"Thank you very much for the jobs received so promptly this morning."

March 1921.

"Very many thanks for such prompt delivery."

February 1921.

"I am very pleased with the way you have executed these Toric lenses, it is one of the best jobs I have seen."

December 1920.

"We are in receipt of the spectacles despatched by you yesterday, and wish to thank you for the quick despatch, and also for the quality of the work, which is excellent. It is a pleasure to deal with a firm such as yours, our only regret being that we did not send our previous prescriptions to you."

December 1920.

"I have been very much impressed by your promptness, accuracy and courtesy at all times, and am greatly obliged to you for the attention you give to my small orders."

December 1920.

"We have recommended your firm to three other Opticians, and trust you will receive their work, as we are perfectly satisfied ourselves."

October 1920.

"Congrats. on excellent job you turned out this week for Toric Panto Rimless Spect. It was real high-class workmanship."

August 1920.

"Thanks very much for prompt return of Rx and Repair work."

May 1920.

"Thank you so much for having the prism job done so quickly."

December 1919.

"I have been very pleased with the way you have dealt with my orders, and thank you for your promptitude in these difficult times."

June 1919.

"I have advised Mr....., D.B.O.A., to send his best work to you together with two or three trade references. He has six shops or more. Trusting you will be able to do it for him."

June 1919.

"I would like to take this opportunity while writing you, of mentioning that I am very satisfied indeed with your jobbing as a whole."

June 1919.

Again I wish to thank you for Rx service which you have done for me."

April 1919.

"Thanks very much for doing job No. 93. Lenticular lenses so quickly, they are very nicely done and our customer is very pleased with them."

December 1918.

"Am very pleased with the way you are getting my work through."

KIRK BROTHERS

WHOLESALE & MANUFACTURING OPTICIANS

36, Gray's Inn Road, LONDON, W.C. 1

The world-wide reputation of our instruments carries with it no penalty to the Retailer.

Every sale shows a handsome profit.

A Barometer of Character

S. & M. Carved oak "Jacobean" period Design and Finish. 8-in. Lacquered Brass Dial and Thermometer Scale, plain red spirit tube. 1st Quality Movement compensated for temperature.

Length 27" × 2" thick.



Write for particulars & general Booklet to :—

SHORT & MASON, Ltd.,

Scientific Instrument Makers,

Aneroid Works, Walthamstow, London, E. 17

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

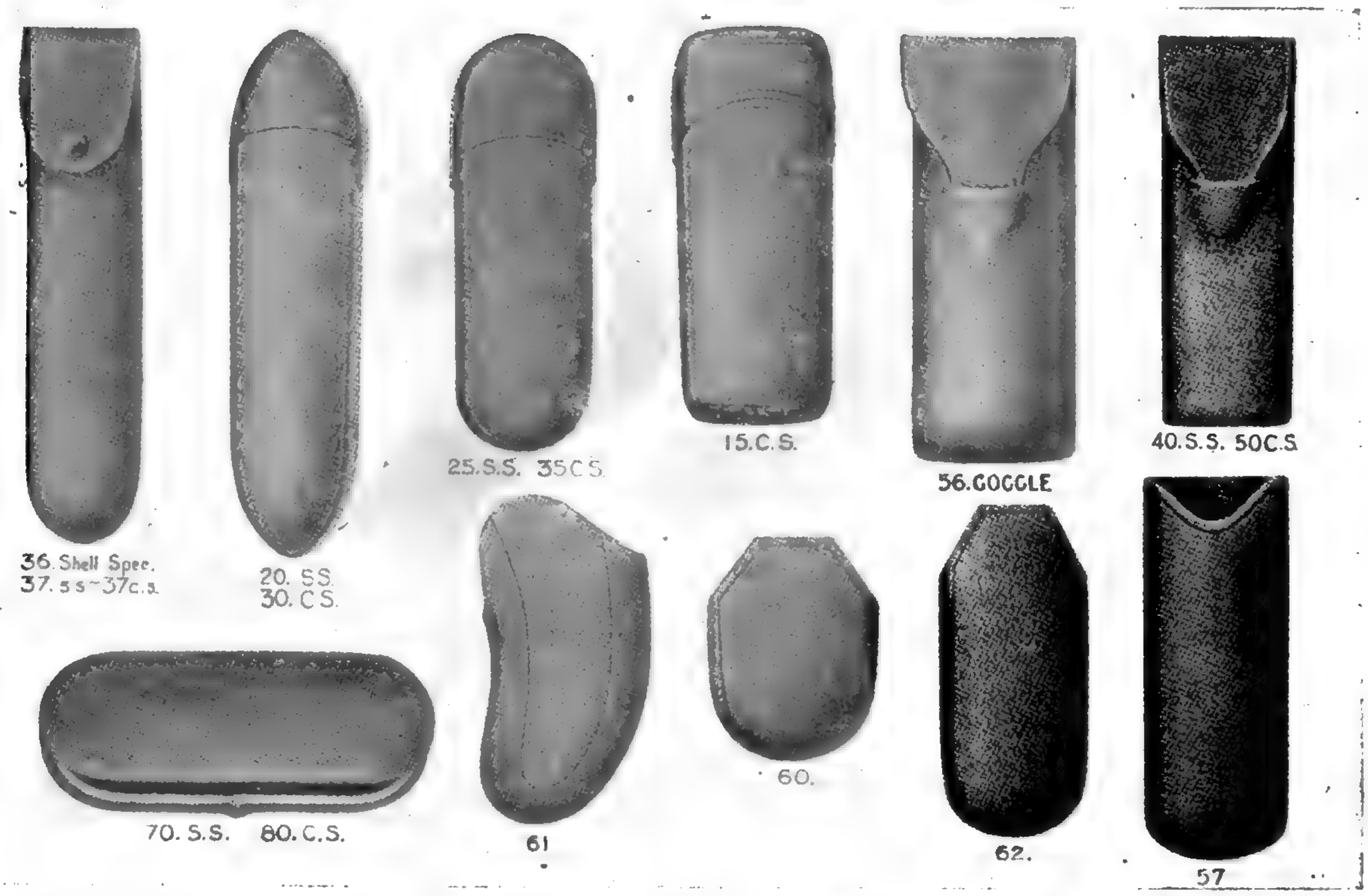
WHOLESALE TRADE ONLY.

W. Smythe & Co. Ltd.

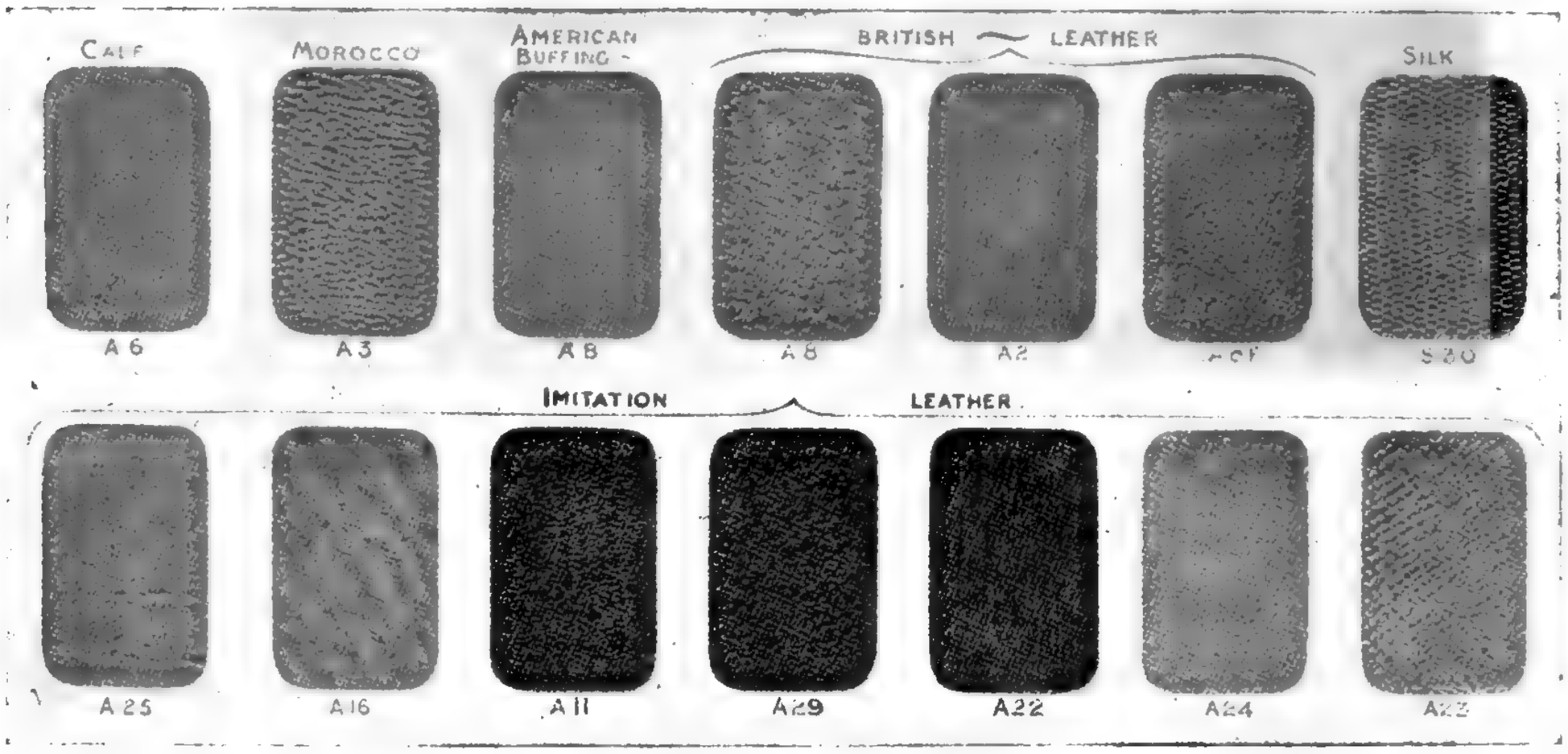
Head Office: 66 and 67, EDWARD ST. PARADE, **Birmingham**

Branch Works—HOCKLEY AND WALSALL.

Patent Optical Case Manufacturers



ALL OUR GOODS CAN BE COVERED WITH THESE MATERIALS AND VELVET.



ILLUSTRATIONS HALF-SIZE. COMPETITIVE PRICES

Also Makers of Patent Spring Lid Cases "NOWATE" Write for List and Prices.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

the Royal Technical College, Glasgow, as a slight recognition of the privilege accorded the N.A.O. to hold its Annual Conference within its walls last August.

Clause (*a*) of the Resolution adopted at the Annual Conference, viz:—"The desirability of instituting an Examination Scheme for Opticians," was then considered and after some discussion it was resolved that the drafting of a suitable scheme be left to the small committee already appointed, and ready for consideration by the next Executive Meeting before being brought to a full Council for final adoption.

After careful consideration of some eighteen applications for membership the following were elected:--Messrs. H. Bruce, 222, Berkeley Street, Glasgow; W. B. Allison, High Street, Arundel; E. Dowling, 714, Stockport Road, Longsight, Manchester; W. L. Bray, Fore Street, Buckfastleigh, Devon; A. E. Scott, 16, High West Street, Gateshead; C. Campbell Macpherson, 250, Woodlands Road, Charing Cross, Glasgow; Sam Radcliffe, 72, Shaw Road, Oldham; Frank S. Oliver, 14a, Cook's Road, Kennington, London, S.E.17; and A. Winston, 7, Sandon Street, Waterloo, Liverpool.

"Bondwell" Football Club.

(C. W. DIXEY & SON.)

At East Finchley on Saturday, October 8th, (Highbury Institute v. Bondwell F.C.), the "Bees," who were without five of their regular players, gave a very moderate display, playing much below their true form. The game was not so one-sided as the score would suggest, but while the home forwards were deadly in front of goal, the "Bees" forwards appeared to have expended ail their stamina by the time they had reached the vicinity of the Highbury goal, and their shooting was weak.

The "Bees" opened the game at a great pace, and the home defence was kept busy in repelling raids. Highbury replied, but although not so speedy, their attacks were more effective and persistent. Highbury were good value for their win.

Result: Highbury Institute, 8; Bondwell, 1.

At Lea Bridge Road on Saturday, October 15th., but for the visiting goalie, the "Bees" would have beaten Alma by more than the narrow margin of 4—3. Some of his saves were of the highest class, and he dealt alike with shots that came from long and short range. In a keen and sporting game, Alma made gallant efforts, but were beaten by a faster and cleverer team. The "Bees" fully deserved their win.

Result: Bondwell, 4; Alma (Kensington), 3.

On Saturday, October 22nd, the Bondwell F.C. will oppose Urswick Athletic F.C., away at Lea Bridge Road. Supporters are cordially invited.

The Curved Lens Demonstrator.

The patent "Rapid" curved lens demonstrator of Messrs. George Culver, Ltd. (White Lion Street, Pentonville, N.), is a simple piece of apparatus which is of unique value for the purpose of demonstrating to customers the advantage of using toric or meniscus lenses, in place of the ordinary biconvex or biconcave. Sight-testing opticians will be much interested in this new instrument, and should write Messrs. Culver, Ltd., for price and particulars, which will be gladly sent on application.

Dr. Sheard's Lectures.

The next lecture of the series by Dr. Charles Sheard, M.A., Ph.D., of the Scientific Staff of the American Optical Company, is to be delivered in Manchester on the 27th inst., at the College of Technology (Manchester University). The subject will be "Important Points in Optical Practice."

A Manufacturing Enterprise.

At the beginning of what is hoped will prove an era of important development in manufacturing optics, it is quite interesting to find the installation of a large factory for the production of spectacle frames and other ophthalmic ware, besides machine-tools for opticians' use in doing prescription work and so on, has now been completed in Willesden Lane, London, and the works are in active operation.

This quite imposing undertaking is known

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,
DANDURAND BLDG., MONTREAL.
Cable "Optical" A.B.C. Code 5th. Edition.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

as the Tennyson Works of Messrs. Optics, Ltd., and is notable for the equipment of an extensive engineering department, fitted with elaborate plant of the most modern type. The plant is designed for making and maintaining machines used in the factory, besides constructing a full range of those workshop appliances in demand among ophthalmic opticians. In addition, all that is essential for the output of high class optical products has been liberally installed; and the works are manned throughout by experts.

As for the output of spectacle and eyeglass frames, this is detailed in a handsome illustrated catalogue sent to us for review, and which has been distributed to many of the principal buyers. The catalogue has some 15 half-tone photographs of this firm's special designs in ophthalmic ware, and includes earchains and uncut lenses, with stock dimension charts, etc. There are also illustrated various lens drills, cutters, hand and automatic edging machines, surface grinders and accessories for the workshop. The catalogue has 68 pages and is of interest throughout. We are assured that the Tennyson optical products are of highest grade, and made specially accurate to the standard dimensions specified. Messrs. Optics, Ltd., intend distributing these goods through the ordinary wholesale channels only. An enterprise of such magnitude obviously bids for support in the optical trade, not only for the reason that the goods are actually made in Great Britain but also on the merits of the products. The address of the Tennyson Works is 87-91, Willesden Lane, London, N.W.6.

NOTICE.

This is to remind you that we shall be issuing our

AUTUMN SPECIAL NUMBER, as usual, (Oct. 28), and we should be pleased if you would send your copy as soon as convenient.

Diffraction Grating Theory of Glaucomatous Rainbow Vision.

The examination with the slit lamp with micrometric measuring methods opened the way for an analysis of diffraction in the subjective phenomena of colour of the living eye. After exposition of the different kinds of gratings in physical optics, Dr. L. Koeppe applies the grating theory to the structures of the refracting media of the eye in observations with the slit lamp. Under normal and pathological conditions, he distinguishes which is of especial differential diagnostic importance, in the following formations of subjective coloured rings in the living ocular media. This summary is reprinted from the 'American Journal of Ophthalmology':—

(*a*) The precorneal or lachrymal Meyer's coloured rings of from 1.25 to 2.50° angle radius in red. This phenomenon is found in conjunctivitis or slight irritation of the conjunctival sac, and in the presence of finely distributed ointment on the cornea. (*b*) The rings due to diffraction of the corneal corpuscles, which physiologically and in glaucomatous corneal stasis without inflammation have in red an angle radius of from 1.50 to 1.75 and seem to coincide with Meyer's rings. (*c*) The lenticular colour rings frequently observed in normal eyes with medium sized and dilated pupils of from 3.5 to 4° radius in red, owing to radial grating of the living lens fibres. (*d*) The rings of from 5.5 to 8° in red in the preglaucomatous and glaucomatous attacks of increased tension without any inflammatory signs. These vitreous rings seem to be due to simple space grating of the vitreous structure which optically becomes more opaque by the increased tension, because the measuring of the diffraction constants of the grating of the vitreous approximately corresponds to the distance relations of the filtrations of the vitreous.

Hence Koeppe urges, in patients who complain of seeing coloured rings, the measuring on Igersheimer's disc, the angle radius of the rings, for the differential diagnosis of true from spurious glaucomatous coloured rings.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Rx

LYONS' SERVICE

Our Aims are
Quality & Promptness
For High Class Rx Work.

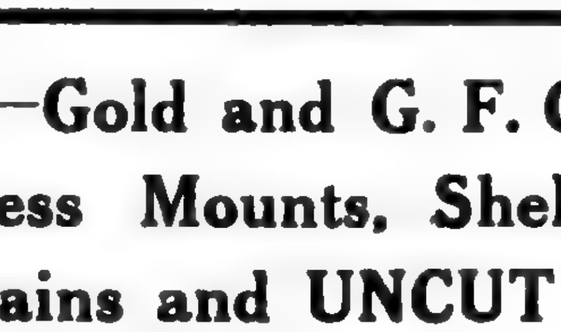
—TRY US.—

Stock Orders solicited

FULL STOCKS:—Gold and G. F. Cable Frames and Astigs, Rimless Mounts, Shell Goods, Cases, Cords, Chains and UNCUT LENSES.

F. H. C. Lyon,
Wholesale & Manufacturing Optician,
59-61, Hatton Garden, London, E.C.1

Telegraphic Address:
CYLTORREXO, SMITH, LONDON.



Regd. Trade Mark.

Telephone No.:
HOLBORN 1203.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"You Cannot TRADE SQ MARK *Buy Better"*

STEVENS' QUALITY
Optical Goods

UNQUALIFIED approval meets this celebrated line wherever introduced.

WE are sole agents for the United Kingdom and can invariably supply your requirements from stock.

One Quality Only—The Best Made

1/10th 12ct. Gold Filled

Specialising in the Fingerpiece Mount

Send us your enquiries for
Spectacles and Eyeglasses—Frames and Mountings

Complete Catalogues on Application

H. WILLIAMSON Ltd.
Optical Section
87/89 GREAT SAFFRON HILL, LONDON, E.C.1

General Optical Supplies—Prescription and Repair Work—
Fittings and Instruments—Optical Machinery

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

TENNYSON
Optical Products

British Manufacture

OPTICS, LTD., beg to announce that they have now completed their first output of finger-piece mounts. Every detail in their manufacture has been studied by Tennyson experts to ensure a high-class finish, accuracy of P.D. Measurements and perfection in their every action. We claim that this mount is superior to all similar mounts on the market.

To enable you to test the above statements, send—*through your wholesalers*—for the "Prince" fitting-set, and you will be agreeably surprised what British enterprise has achieved.

A complete catalogue of all Tennyson Products will be gladly sent on receipt of postcard.

OPTICS Ltd.

TENNYSON WORKS,
WILLESDEN LANE,
LONDON, N.W.6.

WHOLESALE AND EXPORT ONLY

GUARANTEED BRITISH MANUFACTURE PRODUCTS

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Prefix is alright but what really counts is

THE SUFFIX

Crookes glass dates back to say 1913, and made by anyone is original and genuine, but it is important to remember that applies only to Sir Wm. Crookes A and B Glass. Since that date much water has flowed under London Bridge and Sir William only ceased his labours when he brought out his *Ultimate* Glass—the result of his long years of research. The only genuine Crookes Ultimate is made by—

SIR WILLIAM CROOKES ULTIMATE ANTI-GLARE GLASS CO., LTD.,

30, WIGMORE STREET, LONDON, W.

REMEMBER THE SUFFIX—ULTIMATE.

MAKE A NOTE OF THIS PAGE.

JULES LANG & SON
beg to inform the
WHOLESALE PRESCRIPTION TRADE
that, as they hold large stocks of French unedged and edged 1st and 2nd quality Lenses, prices will not be advanced for the present.

JULES LANG & SON,
Charlton Works, Charlton Place, Islington, London, N.1
'Phone: NORTH 2770-2 (3 lines).
Telegrams: "ASSORTED," Phone, London.

C. SWAIN, Ltd.,
51, Strand, London.

A B C Code 5th Ed.
'Phone:—GERRARD 5178. Factory: FOREST GATE.

UNCUT
Sphs
Sph Cyls
Plano Cyls

A.O.C. EDGED
Peris & Bi
Cx & Co etc.,
at Best Prices.

FINEST ROUGH CYLINDER BLANKS,

Also good 2nd Selection
A very attractive proposition for Export and cheaper work.

CHANCE'S GLASS USED.
ACTUAL MANUFACTURERS
ASSOCIATED OPTICAL WORKS, Ld
5, Queen's Buildings, London, W.1
Near Tottenham Court Road.
No Connection with any other Firm. Telephone: Museum 2216.

Elliott Optical Co.,
104 & 105 GT. SAFFRON HILL,
LONDON, E.C.1

TRADE EC MARK.

There is no Better House for

Rx Work.

RXS. RETURNED PROMPTLY,
ACCURATELY DISPENSED
and at REASONABLE PRICES.

Complete Outfit of Rx Stationery supplied, Free of Charge,

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
C. G. DYMOND. M.I.Mech.E., F.I.C.P.A

W. P. THOMPSON & CO.,
12, CHURCH STREET, LIVERPOOL.
Chartered Patent Agents.
H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and AERONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
ESTABLISHED 1878 TELEPHONE CITY 419

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Re DIOPTRICS LIMITED.

(IN VOLUNTARY LIQUIDATION)

The Liquidators have

FOR IMMEDIATE DISPOSAL

The following Stock of Frames, Mountings and Lenses and Stock-in-Trade for the Whole or any part of which they will be glad to receive offers from Wholesalers or Retailers. Stock is New and in Perfect Condition. Lenses are all packeted in Single Packets.

16 5/12	doz.	G. F. Astigs 1/10 12ct. assorted eyes.
10 9/12	doz.	G. F. Astigs 1/20 10ct. D.Y.O. Co.
1 4/12	doz.	G. F. Astigs 1/30 10ct. O.O. eye
13 10/12	doz.	Aristocrat G.F.F.P. Mounts 1/10 12ct.
31 8/12	doz.	S.T.O. Co. G.F.F.P.Mounts Swab and figure 8 Guards, assorted numbers
39 9/12	doz.	D.Y.O.Co. G.F.F.P. Mounts 1/10 12ct. Swab and figure 8 and Cork guards assorted.
10 9/12	doz.	Consol G.F.F.P. Mounts 1/10 12ct. assorted
9 4/12	doz.	Shuron G.F.F.P. Mounts 1/10 12ct. Swab guards
5 5/12	doz.	Itsfits G.F.F.P. Mounts 1/10 12ct. Swab guards No. 512
11 10/12	doz.	D.Y.O. Co. G.F.C.S. Specs. assorted eyes 1/10 12ct.
13	doz.	S.T.O. Co. G.F.C.S. Specs. 1 and 0 eye, heavy frames, 1/10 12ct.
22	doz.	Shuron G.F.C.S. Specs. assorted eyes 1/10 12ct.
41 1/2	doz.	D.Y.O. Co. G.F.C.S. Specs. assorted eyes 1/10 10ct.
13 9/12	doz.	C.A.O. Co. G.F.C.S. Specs. 1 and 0 eye 1/20 10ct.
8 2/12	doz.	Amer. Joint G.F.C.S. Specs. O eye 1/40 10ct.
7 5/12	doz.	G.F.C.S. Spectacles, mixed qualities, eyes, etc.
1 10/12	doz.	G.F.C.S. Spectacles, 1/10 10ct. C.A.O. Co. 1 eye
1 1/2	doz.	"Orbits" G.F. Spectacles, 1 and 0 eye
2 4/12	doz.	G.F. Folders, 1/10 12ct. 1eye, D.Y.O. Co.
2 1/12	doz.	G.F. Folders, 1/20 10ct. 0 eye, D.Y.O. Co.
5 8/12	doz.	G.F. Folders, 1/30 10ct. 1 and 0 eye
5 11/12	doz.	G.F. Ear Chains
7/12	doz.	G.F. Ear Chains, Rose pattern, special
2 3/12	doz.	G.F. Paragon Long Chains
1 2/12	doz.	Silver Ear Chains
6 8/12	doz.	Cheap Long Ear Chains
13 1/2	doz.	Framed G.F. Boston Mounts, 0 and 00 eye, 1/10 12ct. Xyl. and Cork Guards.
26 11/12	doz.	G.F. Rimless Bridges D.Y.O. Co. 1/10 10ct. flat, assorted straps measurements
1	doz.	"Shuron" One-piece Rimless Mounts 1/10 12ct.
1 10/12	doz.	"Itsfits" Framed F.P. Mounts assorted, 1/10 12ct., 1, 0, and 00 eyes
3 10/12	doz.	Assorted Framed F.P. Mounts, 0, 00 and 000 eye
2	doz.	G.F.Rimless Astigs. 1/10 10ct.
10/12	doz	Light G.F. Rimless Spec. Fittings (with bridges)
210	prs.	1/10 12ct. G.F. Rimless Spec. Sides and End pieces, assorted straps and lengths (no bridges)
10 9/12	doz.	Chatelaine Cases, cheap
11	doz.	American E. G. Cases
1 8/12	doz.	Aluminium E.G. Cases
9 11/12	doz.	G.F. Straight Side Specs. assorted eyes and qualities
3 8/12	doz.	Nickel Rimless Spec. Fittings, complete
4 4/12	doz.	Nickel Astigs, 1 and 0 eye
1	doz.	Nickel Straight Side Specs. 1 eye
18 2/12	doz.	Nickel Curl Side Frames, assorted sizes
5 3/12	doz.	Steel Straight Side Frames, 1 and 0 eye
9 1/2	doz.	Steel Curl Side Specs. assorted eyes
1 5/12	doz.	Steel Astigs. 1 eye
43		Readers small, assorted
30		G.F. Lorgnettes, assorted
11	spools	Eye glass Cord
150	prs.	Steel Cable Curl Sides, assorted lengths
44	prs.	Nickel Cable Curl Sides, assorted lengths
71	prs.	G. F. Straight Sides, Eng.and Amer. joints
79	prs.	Steel Straight Sides
42	prs.	Steel (blue) Straight Sides
21 1/2	prs.	Gold Rimless Spec. Sides and End pieces (no bridge) assorted lengths
4 1/2	doz.	Gold Ear Chains
8/12	doz.	Gold Cable Frames
12	doz.	Assorted G. F. Boston Studs
43	prs.	Flat Kryptok Blanks
35 1/2	prs.	Toric Kryptok Blanks
70	doz. prs.	Uncut Spheres Minus, assorted powers
21	doz. prs.	Uncut Spheres Plus, assorted powers
29	doz. prs.	Bevelled Spheres Plus, assorted eyes and powers
15	doz. prs.	Bevelled Spheres Minus, assorted eyes and powers
75	doz. prs.	Buffalo Uncut Peno, Plus
27	doz. prs.	Rough Cyls. 1st Quality, Minus, assorted powers
24	doz. prs.	Rough Cyls. 1st Quality, Plus, assorted powers
7	doz. prs.	Plus Uncut Peris, 1st quality
202½	doz. prs.	Plus and Plus Sphero Cyls. 1st quality uncuts assorted
64 10/12	doz. prs.	Minus and Plus Sphero Cyls. 1st quality uncuts assorted
73 7/12	doz. prs.	Minus and Minus Sphero Cyls. 1st quality, uncuts, assorted
82 1/2	doz. prs.	Plus and Minus Sphero Cyls. 1st quality, uncuts assorted
93	doz. prs.	Plus and Plus Sphero Cyls. 2nd quality, uncuts assorted
50	doz. prs.	Sphero Cyls. in 1/8 Diopters, chiefly plus and plus assorted
38½	doz. prs.	Plano Cyls. 1st quality Plus, assorted powers
7½	doz. prs.	Plano Cyls. 1st quality,Minus,, assorted powers
8½	doz. prs.	Memsons Plus Uncuts, 1st quality, assorted powers
15 9/12	doz. prs.	Memsons Minus Uncuts, 1st quality, assorted
3	doz. prs.	Memsons Plus and Minus, 2nd quality
8½	doz. prs.	Toric Uncut Sphero Cyls. and Plano Cyls. 1st quality
19½	doz. prs.	Toric Uncut Sphero Cyls. 2nd quality
9	doz. prs.	Toric Uncut Rough Cyls. Plus and Minus assorted
3		Twenty drawer Lens Cabinets, 32 sections in each drawer
1		Sixty-four drawer Counter Cabinet, suitable for keeping lens stock.
112		Black cedarwood boxes, sectioned off, suitable for keeping lenses or small stock
38 prs.		Cylinder Tools for M22. Cyl. machine. (secondhand)
96 prs.		Spherical Tools, (secondhand)
71 half pairs		Spherical Tools, (secondhand)

Offers should be forwarded to or further particulars obtained from :—

THOS. DUTTON (Dutton Armstrong & Co.)
4, Piccadilly, Manchester.

or G. H. LAWTON (E. Lawton & Son)
14, Brown St., Manchester.

Joint Liquidators

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

FOR SALE Trial Case, £9 10s. Blackham, Opticians, Blackburn.

BARGAIN. Lens drilling machine with diamond, nearly new. Apply, Box 3489, c/o "The Optician," 125, Fleet Street, E.C.4.

FOR SALE. Fine 4-prism Browning Spectrometer in perfect condition. Complete with three eye-pieces, and all accessories. Can be inspected in London by appointment. Reply, Box 3486, c/o "The Optician," 125, Fleet Street, E.C.4.

FOR SALE. Half-plate stand camera, mahogany, 10" ext. Beck-Steinheil Unofocal Ser. 1., No. 5. f/6 with Beck Celverex shutter, T,B to 1/80 sec, 3 mahogany double dark slides, stand, focusing cloth, waterproof case, the whole £3 10s. Also ¼-plate Holborn reflex, magazine 12, Ilex. R.R. f/77. T. and I to 1/100 sec. Leather case, £2. Please address, Box 3475, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

OPTICIAN wishes to purchase business. Box 3490, c/o "The Optician," 125, Fleet Street, E.C.4.

£1,000 will purchase an excellent sight-testing Optician's business in one of the best positions in London W.C. district. Turnover £2,000. Open to complete investigation and can be visited by appointment. Write in first instance, to Box 3491, c/o "The Optician," 125, Fleet Street, E.C.4.

ON SALE. Well-established private optical practice, modern electrical workshop equipment, situated in large industrial Lancashire town. Principals only. Box 3487, c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 8*

YOUNG MAN, 21, 6½ years' retail experience would like to take up wholesale work. Willing to commence at small salary. Apply, Allen, 7, Dunford Road, Holloway, N.7.

GIRL required for looking out prescription work, marking off, and checking for wholesale house in London. Permanent. Apply Box Office, No. 5710, c/o "The Optician," 125, Fleet Street, E.C.4.

OPHTHALMIC AND SCIENTIFIC
MOULDINGS
Supplied in any Curvature and Glass.
CROOKES A SPECIALITY.
REYNOLDS & BAILEY, 15-19, VINE ST.,
LONDON, E.C.1



OPTICAL BLOCKS
To illustrate all features of Optical Service. Write for Lists.
Chemists' Design Service,
12, Humberstone Gate, Leicester.

C. BAKER 244 HIGH HOLBORN LONDON
Estab. 1765
YOUR REQUIREMENTS however exacting, will probably be met from our Second-hand Stock
WRITE TO-DAY FOR LIST, POST FREE.

TO WHOM IT MAY CONCERN.
The Publishers of *The Optician* learn that statements have been made attributing to this newspaper as the organ of the optical industry, certain statements or opinions which have been formulated by an advertiser in its advertising pages. Therefore it is notified that on proof of any such misrepresentation, intended to reflect on the editorial conduct of the journal, proceedings will be instituted to recover damages

PERCY S. DE SAULLES.
Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES.
Micro Cover Glasses, Glass Cells and Cavity Slips, etc.
The Platts, Amblecote, Stourbridge.

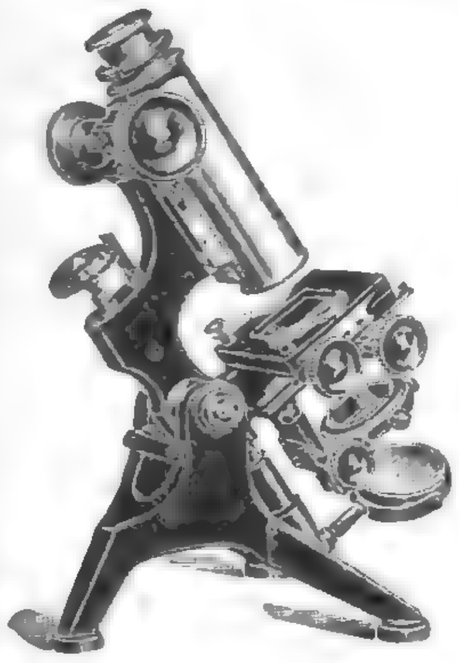
DIXON & HEMPENSTALL,
Wholesale and Manufacturing Opticians,
12, SUFFOLK STREET, DUBLIN.
Telegrams "Optics, Dublin."

NORTHAMPTON POLYTECHNIC INSTITUTE.
CLERKENWELL, LONDON, E.C.1
Principal—R. MULLINEUX WALMSLEY, D.Sc., F.R.S.E.
DEPARTMENT OF
OPTICAL ENGINEERING AND APPLIED OPTICS.
Six lectures, introductory to the ordinary courses of the department, will be held in the Institute on Wednesday evenings during the Autumn. The lectures will be illustrated extensively by experiments and will be so arranged as to leave time for questions and discussion at the end of each lecture.
Below are particulars of the Subjects to be dealt with and the dates of the lectures.
Wednesdays, October 26th, and November 2nd at 7.15 p.m., two lectures on
"The Eye and Man's Work in Assisting It."
By PROFESSOR F. J. CHESHIRE, C.B.E., A.R.C.Sc., F.Inst.P.
Wednesday, November 9th, at 7.15 p.m., on
"The Human Eye, a Living Organ."
By C. L. REDDING, F.S.M.C.
Wednesday, November 16th, at 7.15 p.m., on
"Some Optical Munitions of War."
By H. H. EMSLEY, B.Sc.
Wednesday, November 23rd, at 7.15 p.m., on
"Some Applications of Optics to Engineering."
By H. H. EMSLEY, B.Sc.
Wednesday, November 30th, at 7.15 p.m., on
"Polarised Light and Polarisation Apparatus."
By PROFESSOR F. J. CHESHIRE, C.B.E., A.R.C., Sc.; F.Inst.P.
Admission by ticket, to be obtained at the Institute on the evenings of the Lectures.
For the course of Six lectures, 2/6; for any Single lecture, 9d.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

SELL WATSONS'
BRITISH-MADE
MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,
313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1937.

WILLESDEN IS A BIG PLACE

There is more than one Optical house in Willesden but only one W.O.W.

We are not connected in any way with other Optical concerns in Willesden or elsewhere.

Keep W.O.W. distinct in your mind.

Think of quality and W.O.W. as synonymous terms—and you are right.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY:
DUDDEN HILL LANE, N.W.10

Rx

SANDRO LOWY
Optical Rx Specialist,
88, Goswell Road,
LONDON, E.C. 1

Telephone: CITY 304 (two lines)

Telegrams: SANOPTIC, LONDON.

Rx

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

The Employment Bureau.

A.—**Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

REFRACTIONIST, F.S.M.C., 13 years' experience with good firms, desires permanent position, accustomed to branch management. Box 5700, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERT Checkers and setter required for prescription department. Good wages. Alfred Mills & Co., 22 & 23, Verulam Street, E.C.1.

LENS Worker required for all-round first-class prescription work. Apply London Optical Co., 344-354, Gray's Inn Road, W.C.1.

RETAIL Assistant, 15 years' experience, highest credentials, would like to travel in Ireland for wholesale firm. What offers to Box 5703, c/o "The Optician," 125, Fleet Street, E.C.4.

JOBBER. Good all-round, with some experience in rimless glazing. State age, experience and wages. Box 5702, c/o "The Optician," 125, Fleet Street, E.C.4.

A "FIRST" Assistant, 10 years' optical experience with eminent houses, desires change. Fully competent in sight-testing, fitting and all workshop jobbing. Also thoroughly conversant with photographic department. Moderate salary, Box 5701, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACER, 24, seeks position London or suburbs. Thorough experience in kryptoks, segments, etc. Apply, T.D., 251, East India Dock Road, E.14.

ASSISTANT, 19, seeks situation with optician, nearly two years' experience, familiar with prescription work. Studying for F.S.M.C. City preferred. P.V.T., 292, Lancaster Road, Kensington, W.11.

RELIABLE Sight-tester qualified seeks berth as first assistant or manager, workshop experience. Box 5709, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. desires morning work. Experienced tester, good salesman. Would consider attending jewellers or chemist to start sight-testing side, own equipment if necessary. Box 5706, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT required temporarily, Midlands. Particulars of sight-testing experience, age and salary to Box 5707, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN, 23, keen, D.B.O.A., retail experience, seeks position as representative of wholesale firm. Willing to go abroad. Box 5705, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED Refractionist, retinoscopist, etc., seeks change, good personality, long sight-testing experience. Reply, J.H., 58, Hugh Gardens, Benwell, Newcastle-on-Tyne.

EXPERIENCED Refractionist, competent at repairs, edging, glazing rimless, bifocal and shell work, used to management, desires change. Excellent credentials. Box 5704, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN recently qualified desires berth where opportunity for advancement and good experience can be gained. Must be in or near London or Glasgow. Box 5708, c/o "The Optician," 125, Fleet Street, E.C.4.

SHELL Spectacle and lorgnette maker, good repairer. Write, S. Clarke, 37, Millais Road, Leystonstone, E.11.

YOUNG MAN, 20, four years' experience in frame and eyeglass fitting with local dispensing optician requires situation with sight-testing optician. Disengaged. Reply H. E. Postlethwaite, 63, Earle Road, Edgehill, Liverpool.

APPRENTICESHIP wanted with good firm to learn all round gold spectacle making (leaving school). Scrivener, 4, College Street, Islington, N.1.

POSITION required in block or prescription surfacing. Able to take complete control of any surfacing plant. Good references. Apply, Box 5695, c/o "The Optician," 125, Fleet Street, E.C.4.

METEOROLOGICAL and Scientific instrument maker, disengaged, requires position, maker or repairer, hand-turning, bench work, finishing, lacquering, own tools, 18 years' experience, any distance. F. Orford, 83, Ashmore Road, Paddington, W.9.

SECOND Year student Northampton Institute requires position with sight-testing or wholesale opticians. Sound knowledge of all Rx work, machine and hand edging, slight knowledge of single surfacing. Box 5696, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, all-round worker, rimless fitting essential. Good opportunity. Male or female. Write stating experience and salary required. References. The Clyde Optical Works, 80, Great Clyde Street, Glasgow.

SURFACER requires situation, used to best prescription work, life-time experience, age 36. Ex-service man, good references. W. H., 1a, Ebenezer Buildings, Rotherfield Street, N.1.

F.S.M.C. seeks re-engagement as managing assistant in good class consulting business. London interview. Box 5690 c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, age 21, with 5 years' experience in sight-testing seeks situation. Good appearance and conscientious worker. Box 5689, c/o "The Optician," 125, Fleet Street, E.C.4.

INSTRUMENT Test room assistant, intelligent and ambitious requires permanency. Any capacity, 12 years' instrument work, factory routine, administrative work, etc. Box 5688, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION required by energetic man (24), single, partly qualified. Go anywhere, but in or near London preferred. Sound knowledge of optical business routine, good sight-tester, excellent references. Box 5687, c/o "The Optician," 125, Fleet Street, E.C.4.

JEWELLERY, first assistant, must have knowledge of optics, qualified preferred. Manchester district. Full particulars. Box 5680, c/o "The Optician," 125, Fleet Street, E.C.4.

RECEPTIONIST. Young Lady, 21, experienced shorthand typist and general office routine, 5 years with leading firm of opticians. Box 5685, c/o "The Optician," 125, Fleet Street, E.C.4.

SITUATION wanted with retail London optician by young lady assistant, smart saleswoman, can neutralise and do repairs. 5 years' reference. Knowledge of shorthand and typing. Miss Sellwood, 36, Talbot Road, West Ealing, W.

REFRACTIONIST seeks position as manager or assistant, 17 years' experience, thoroughly practical and reliable, energetic, tall, age 33, good appearance, reference present employer. "Ophthalmic," 63, Broad Street, Bristol.

REFRACTIONIST (30), with 10 years' City experience, desires change, Manchester district preferred. Box 5693, c/o "The Optician," 125, Fleet Street, E.C.4.

GLASS Blower seeks situation, good references. F. O., 3, Sidmouth Street, Gray's Inn Road, W.C.

SCIENTIFIC and Mechanical engineer requires situation, home or abroad. Thoroughly experienced in all optical instruments and machines. Capable draughtsman designer. Box 5692, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED Assistant wishes position with Midland firm. Box 5698, c/o "The Optician," 125, Fleet Street, E.C.4.

Concluded on page 6.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE MIDGET



OPERA GLASS.

(Actual size of Illustration.)

Perfect Interpupillary Adjustment.
Superior Lenses.

Claims immediate attention and commands ready sale.

Choice variety:—BLACK MOROCCO, GILT, FANCY LEATHER, PEARL, etc.

WRITE FOR SAMPLE.

R. ARCHER & SONS, Ltd.,

1, AMWELL STREET, LONDON, E.C.1

Digitized by Google

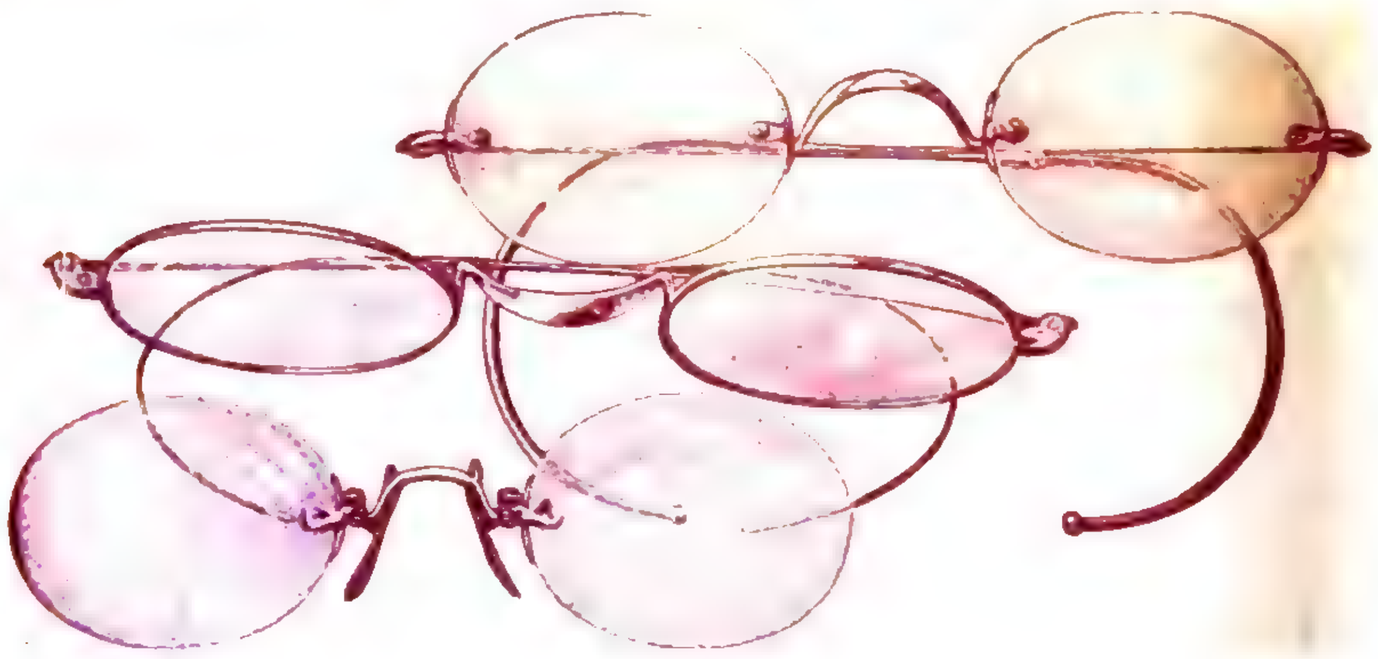
Original from THE OHIO STATE UNIVERSITY

AMERICAN·OPTICAL·COMPANY, LIMITED

WELLSWORTH

ALUMNICO

SPECTACLES and EYEGLASSES



AOCo. supremacy in white Metal Goods dates back to the early history of the oldest Optical House in America. As one of the oldest lines, Wellsworth Alumnico embodies the practical experience of generations of skilled workmen.

All AOCo. Alumnico Goods are manufactured from a special metal made by them according to their own specifications. This explains its strength resiliency, evenness of temper and freedom from brittleness.

If you have never used Wellsworth Alumnico, we suggest that you try it out on some of your most difficult work. Such a test will do more to convince you than any words we can write here.

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C.4. Printed by The Century Press, Fulham. Oct. 21, 1921.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

The OPTICIAN
And SCIENTIFIC INSTRUMENT MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1596 FRIDAY, OCT. 28, 1921.

ROSS BINOCULARS.

British Government Tests have proved these to be the finest Binoculars in the world.

Send for our new catalogues and terms.

ROSS Ltd., Clapham Common, LONDON, S.W. 4

ELLIOTT'S Rx SERVICE

leaves nothing to be desired.

ACCURACY—PROMPTNESS and REASONABLE PRICES.

104/5, GT. SAFFRON HILL, E.C.1



ARCHER LORGNETTES

IN GOLD AND TORTOISESHELL WITH THE AMWELL STREET FINISH

R. ARCHER & SONS, Ltd.,
1, Amwell Street, London, E.C.1

Reg'd at the G.P.O. as a newspaper PRICE 1/- Subscription post free 12 months 17/-
Postage in United Kingdom 1d

Digitized by Google Original from THE OHIO STATE UNIVERSITY

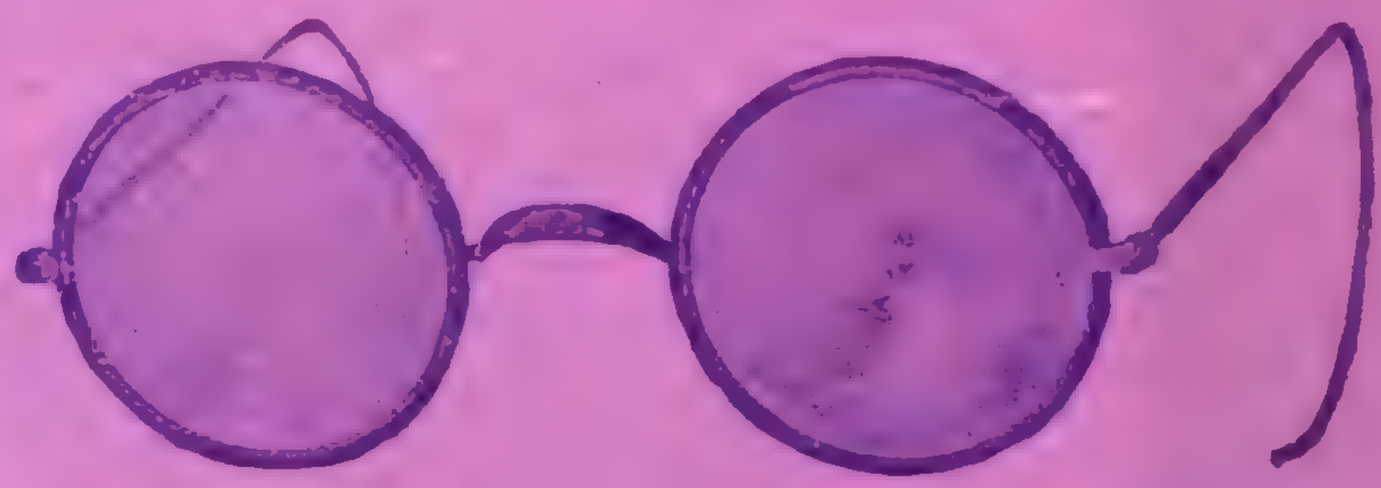
AMERICAN·OPTICAL·COMPANY, LIMITED.

WELLSWORTH WINDSORS.



Fits-U Windsor.

THE FIRST THING—that people require of Glasses is good looks. Sometimes it is called distinction of appearance, sometimes attractiveness, sometimes simply beauty. But whatever it is called the Fits-U Windsor has it.



Windsor Spectacle Frame.

When you sell a metal-zylo frame be sure that you make a permanent customer, and not merely a transient sale, by sending out a Wellsworth Windsor. These frames are built to please both you and your customer. They have the inlaid metal eye-wire—the power behind the rim—which holds the lens firmly and accurately in position. Moreover the Windsors have another feature, entirely new in the spectacle world—the complete absence of dis-figuring metal patches at the points where temples and nosepiece join the zylo rims.

The Wellsworth Windsor Construction is protected by British Letters Patent. Beware of Infringements.

WELLSWORTH

TRADE MARK (Regd).

OPTICAL PRODUCTS.

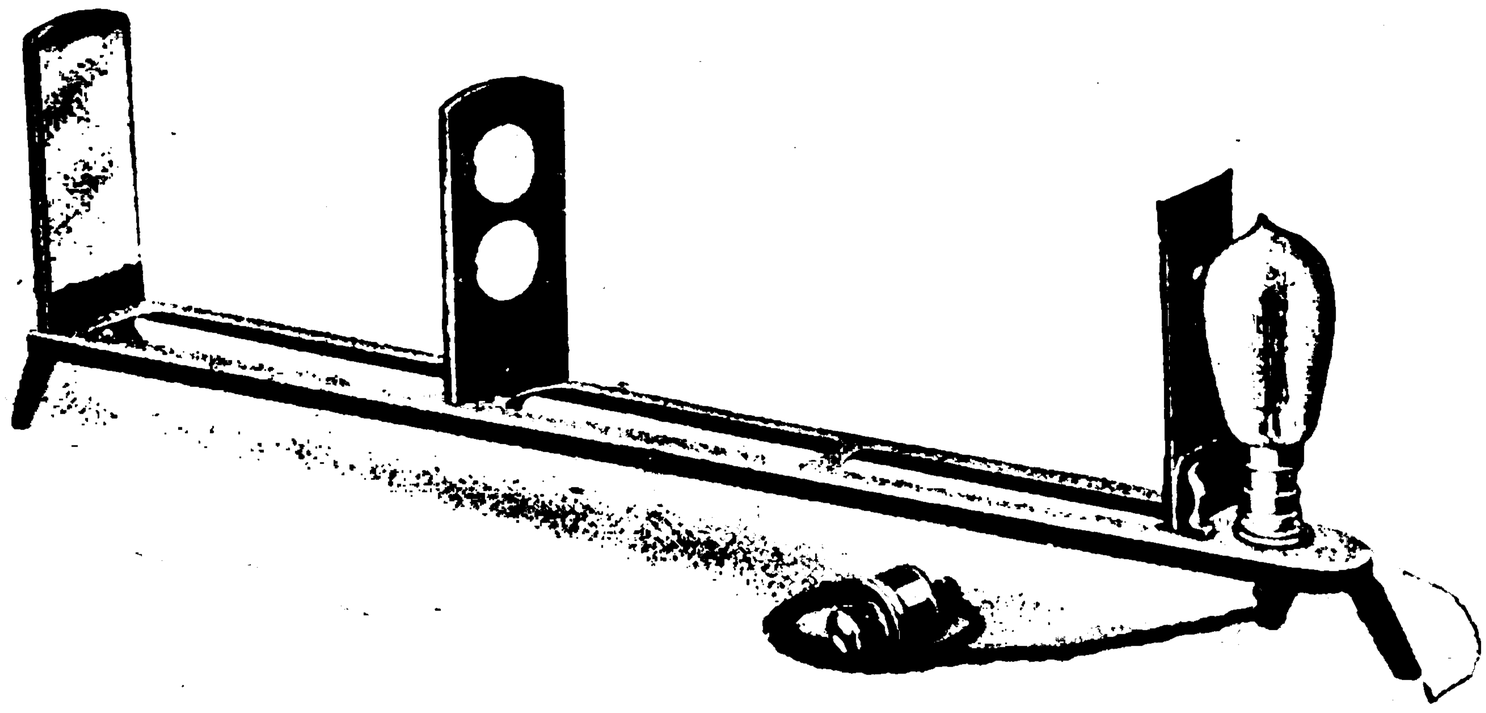
Offices, No. 39 Hatton Garden, E.C., LONDON

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The "RAPID" Curved Lens Demonstrator

Patent No. 112074



A MOST CONVINCING DEMONSTRATION OF THE ADVANTAGES GAINED BY USING TORIC OR MENISCUS LENSES IN THE PLACE OF BICONVEX OR BICONCAVE.

Particulars and Price on Application.

GEORGE CULVER LTD.,

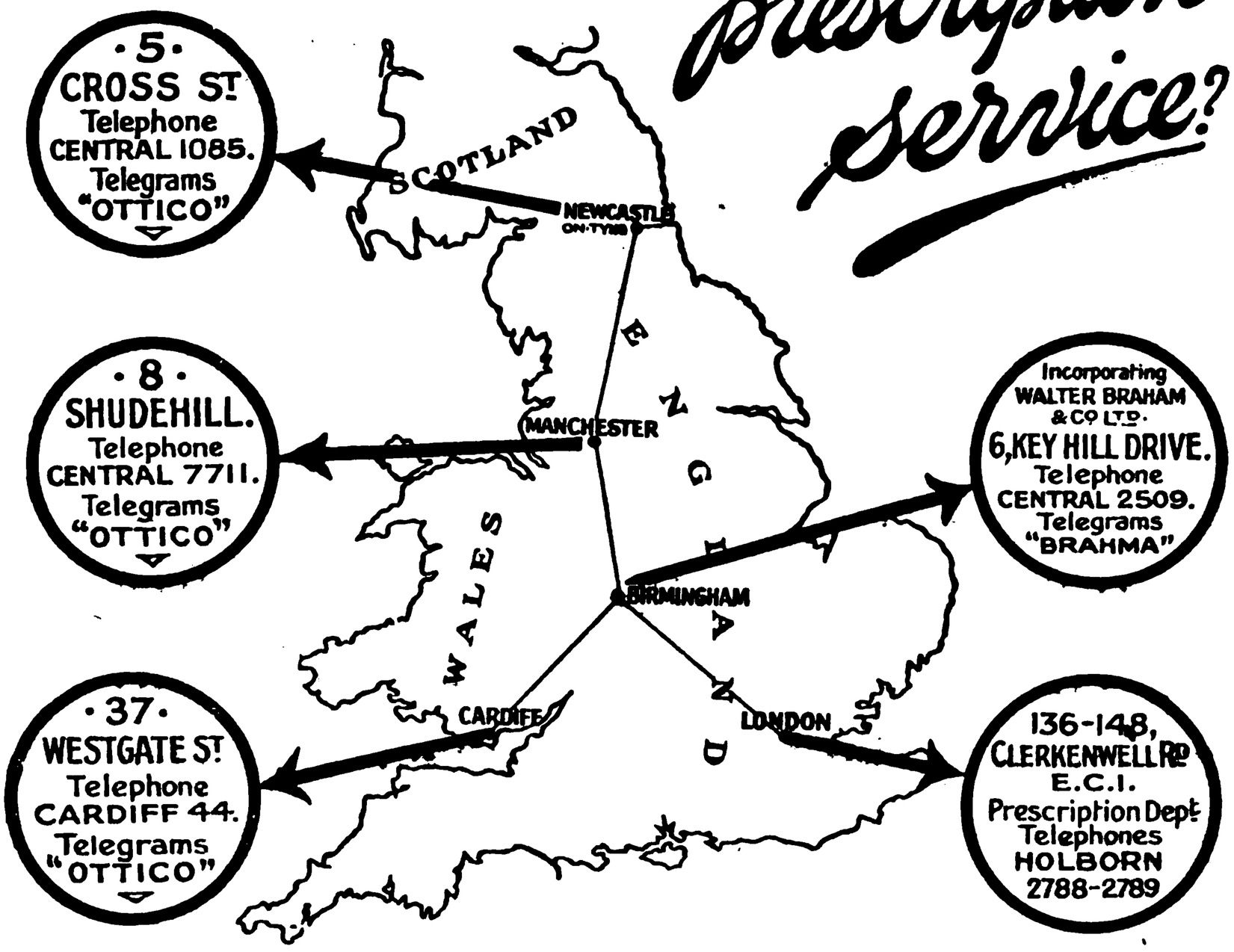
Manufacturing Opticians,

PENTONVILLE, N.1

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

J&R.F.LTD.

Why not link yourself with our prescription service?



Each Branch has a Complete Prescription Equipment.

LINK
QUALITY SERVICE
BRAND
Reg[d] Trade Mark.

J & R. Fleming Limited.

136-148. Clerkenwell Road, LONDON, E.C.1.

Telegrams: "OTTICO" SMITH, LONDON.

J&R.F.LTD.

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
Col. & Ald. Sir CHARLES C. WAKEFIELD, Bt., C.B.E.

Upper Warden
The Rt. Hon. VISCOUNT HILL.

Renter Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Director of Examinations
The Rt. Hon. Sir WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in May, 1922.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT·MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,596

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices
123-5, Fleet Street, London, E.C.4. Tel. City 5616.

LONDON, FRIDAY, OCT. 28, 1921.

Readers of this issue are invited to become regular subscribers. And in furtherance of the suggestion that they should do so, we ask attention to the fact that *The Optician* is carried on not only for the trade but largely *by* the trade itself. Scientific, professional and commercial topics are equally done justice to; and in all three directions, considerable development is certain and imminent. We welcome correspondence or other contributions to the editorial pages, dealing with any matters of general interest to the industry.

* * *

German Competition.—A correspondent, whose letter we have not space to print fully this week, suggests that in connection with the British optical and scientific instrument industry, we are all inclined to lay too much stress on effects of the extraordinary and progressive depreciation in the German exchange; and too little on the efficiency of the German factory system, which it ought to be within our power to rival. Like the United States of America, Germany is self-contained both economically and politically to an extent that does not obtain here, and cannot be reached

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

unless by means of the familiar prescription, Free Trade within the Empire. But "Great Britain occupies towards the agricultural communities, including the overseas Dominions, much the same dependent position as a day labourer does towards his capitalist employer. Great Britain relies for existence on vast imports of food, and has to market abroad the product of its factories in competition with more fortunately situated people. Oversea markets for the output of British labour have to be found at all costs, so there is a lack of bargaining power to secure Imperial Free Trade, unless by subsidising imports of Colonial produce, which our landed interests would not tolerate."

* * *

The Exchanges.—With regard to questions of currency, "There is an international standard of value which remains a fixed ratio, however its terms may be varied, and quite independently of the fact that governments may play with bankruptcy by printing stacks of paper money. As hitherto, gold serves now for a convenient term in the ratio; and trade can be and is being carried on upon the gold basis, independently of any fluctuations of a local paper currency. To enter into commitments based on paper marks is nothing else than banking on the good faith of the German Government, which is not necessary. Credits can be and are being given on the gold basis as between individual British and German merchants or manufacturers, duly recommended to one another as honourable commercial men." The device of the progressively depreciated mark helps German manufacturing interests to great prosperity by exploiting their own labour resources, and it is most inconvenient to us; but that must tend to right itself in time. Meanwhile, so far as ophthalmic ware is concerned, the expensive raw materials, such as gold and tortoiseshell, have to be imported into Germany and, of course, paid for in accordance with the international standard of value; only the cheap materials, as steel and glass, enjoy the present artificial stimulus in German home production.

* * *

Advertising.—Our own idea as to the duty and interest of British manufacturers—apart from the obvious need of reducing labour costs and waging war on the incubus of bureaucracy—is that the foundations of belief that British goods still challenge all comparisons should be extended, here and abroad, by a more liberal campaign of advertising. That trade publicity is the lifeblood of all commerce, carried on through wholesale channels, needs no argument. The merchants and manufacturers who distribute optical goods by wholesale, cannot have too much trade publicity; and it is not to be questioned that *The Optician and Scientific Instrument Maker* is the most effective medium for the purpose.

Preventable Headaches.

Dr. W. H. Riley says that a large percentage of the world's headaches are preventable. He writes:— Preventive headaches are those that are easily preventable by common sense in avoiding careless habits in sitting, reading and working. Headaches are often due to crowded, ill-ventilated public places, school rooms, business places, department stores, moving picture theatres, etc.

In this connection we may include the homes where fresh air is not a matter that receives the attention it deserves. How many women there are who do housework, especially in heated kitchens, where the air is breathed over and over again. The flushed face, tiredness and aching head are not always due to the work about the hot stove or the amount of hard work, but to the vitiated atmosphere in which the work is done. To open the windows frequently and change air will prevent such headaches. Ten minutes out of every hour the windows should be opened for fresh air.

Bad postures in sitting causes headaches. When one sits in a slouched position the blood stagnates in the large abdominal blood vessels because free circulation is impeded.

Headaches due to eyestrain are usually located just above the eyes or in the temporal region, and the indigestion or constipation headache is in the forehead and front of the head, sometimes reaching to the top of the cranium. Those caused by disturbances of digestion are also sometimes in the lower and back part of the head in the occipital region. Eyestrain headaches are possibly the most common and also the easiest remedied—by the wearing of proper glasses.

You cannot afford to do without THE OPTICIAN. As a manufacturer you need be acquainted with all published information bearing on design and on workshop technique. As a merchant you require to be kept informed of the latest novelties in spectacle-work and scientific instruments, so that you may be able to deal intelligently with all enquiries on these matters. As a sight-testing optician you want to know what is newest in connection with the refraction of the eye and the prescribing and fitting of spectacles. If you are interested in any way in the optical industry, you must keep abreast of its development by reading the technical and other trade news which is to be found only in THE OPTICIAN,

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Geometrical Ophthalmic Optics.—VII.

By WILLIAM SWAINE, B.Sc.

Paraxial Schematic and Reduced Eyes.

It is well-known that the refracting system of the eye consists of the cornea at the front and the crystalline lens bounded by the aqueous and vitreous humours. From the time of Petit (1731) measurements have been made, both direct and indirect, to determine the forms, separations and indices of the several surfaces and media. It has been found that the forms of the surfaces are not quite spherical, neither are they quite centered. The front surface of the average cornea for example has a slightly greater curvature vertically than horizontally whilst there exists around the axis a small approximately spherical cap outside of which the curvature undergoes considerable modification which in addition possesses no axis of symmetry. In addition the line of centre of the front and back surfaces of the crystalline does not pass through the centre of the spherical cap of the cornea. These deviations however do not seriously affect the paraxial considerations which we are about to investigate, and the eye will be considered as a centered system of spherical surfaces. It would be mere repetition to give an account of the standard measurements, as they have been fully collated by Helmholtz and brought up to date by Gullstrand in the first volume of the enlarged third edition of Helmholtz's "Physiological Optics," (1909).

The first attempt to construct for calculation purposes an average or schematic eye was Listing (1851), for an eye at rest in sharp focus for distance with yellow light. His average data for the indices and radii were accepted by Helmholtz who modified the separations (1855). In addition, the latter worked out the data for the eye accommodated for near vision.

On the appearance of Donder's work ("The Consequences of the Anomalies of Refraction," 1864) and in view of the careful measurements of the refractive indices of the crystalline and humours by Matthiessen, Helmholtz modified the corneal radius (from Donders) and also the refractive indices (1875). The table given below shows the optical constants, the calculated powers, positions of the cardinal points from the vertex of the cornea, of value later. *Listing I* and *Helmholtz I* refer to these earlier schematic eyes and *Helmholtz II* to the amended eye, which latter has been largely used and is used to a large extent by current treatises. The *Listing II* was the amended eye used by Wüllner (1877) and which in turn has been corrected for an arithmetical error by Dr. Faber in his translation of Ferrari's Dioptric Instruments (1919).

Article III (June 3, 1921 p. 213) and article VI (Sept. 9, 1921 p.39) of this series in *The Optician* show examples of the method of calculation.

It will be noticed that the cornea was assumed of the same refractive index as the aqueous even in the case of the Helmholtz II eye, which followed Matthiessen's work establishing the corneal index as 1.377. This was probably due to the fact that the radius of the second corneal surface was not measured for the living eye until the work of Tscherning, up to whose time the second corneal surface was considered inoperative. That there was a difference in curvature followed from measurements by Krause on dead eyes.

The six *schematic eyes of Matthiessen* are the result of his extensive investigations on the index and form of the laminæ of which the crystalline is constructed. They are taken from his first published data which assumed the outer surface radii of the crystalline and the cornea of the Helmholtz I eye. The ultimate aim of the schematic stratified crystalline lens of this investigator was the calculation of the 'quality' of the retinal image produced by rays not fulfilling the paraxial conditions,—spherical aberration, chromatic aberration and curvature of the image. Other investigations in the same direction included those of Lippick (1878), Herman (1882), Matthiessen (1883), Gullstrand (1908) and Monoyer (1908).

Below is given a brief indication as to the results of Matthiessen's first work. That the refractive index of the crystalline was greatest at the centre was known to Young (1801) and measured by Chossat (1818), Brewster (1819), Krause (1855) but their recorded data are not easily comparable (temperature details not given and varying spectral lines), although they have given a distilled water index indicator. Matthiessen's work was facilitated by the introduction of the Zeiss Abbe refractometer, and he investigated the index of vari-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

ous spectral lines at a known temperature. From observations by Treviranus and Tredeman for an unaccommodated eye, the highest index of the kernel was found to lie a little to the front of half way in the proportion approximately of 1.6:2. Assuming this ratio, Matthiessen deduces an empirical relation connecting index with distance from this centre. The accompanying figure 9 shows the form of the crystalline and the layers of equal refractive index. The parabolic curve above gives the variation of index and the straight curves, the ordinates for which are indicated on the right gives the radius of the equi-index surfaces.

Both Listing and Helmholtz give a figure for the "*total*" or as described by Zehender

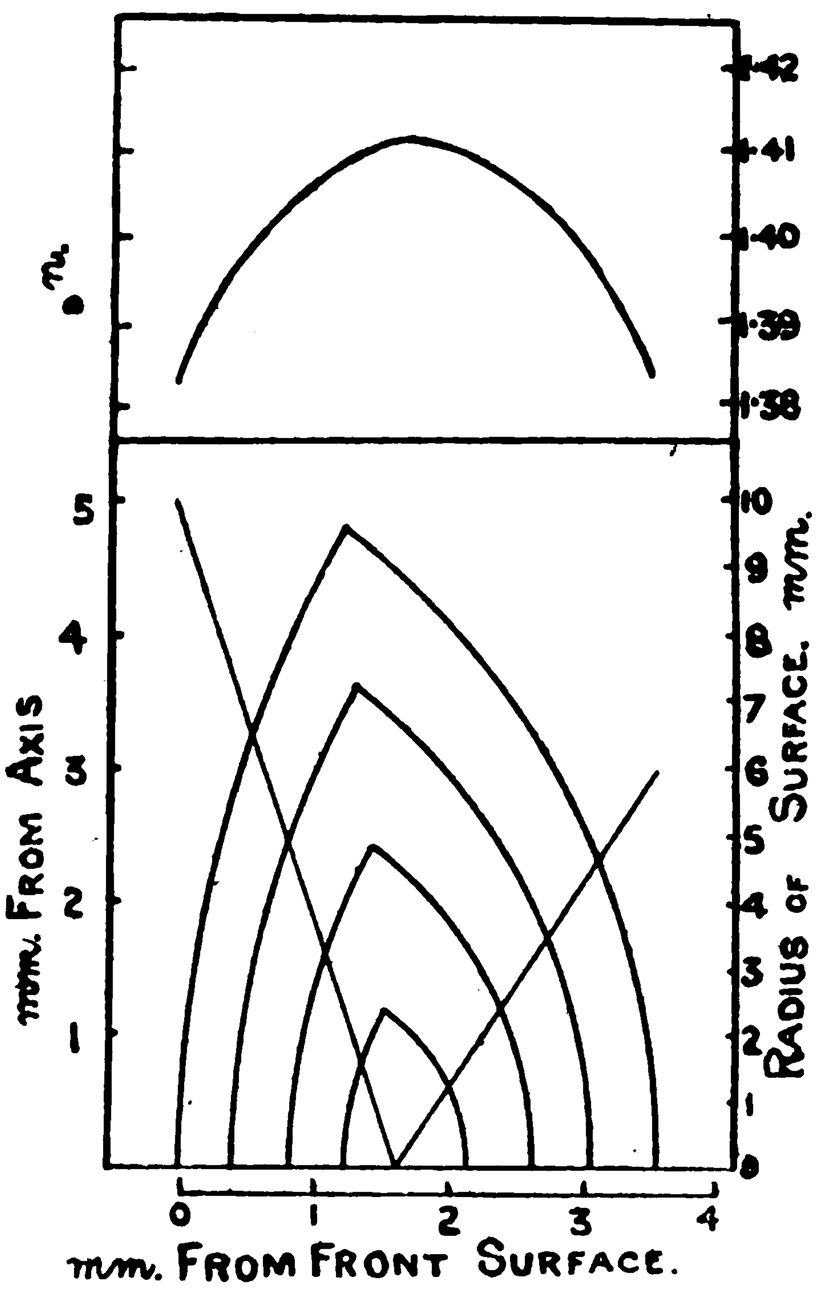


Fig. 9

"imaginary" refractive index for the crystalline, and it will be observed that it is greater than that of the core. The total index of the lens is that index assumed uniform which makes the refracting power of a crystalline lens of the same outside curves and surrounded by the same media as the actual laminated lens. As will be seen from the figure, the laminated lens acts roughly as a central positive core lens surrounded by negative menisci of less refractive index. These surrounding lenses will neutralize partly the core but not to so great an extent as if they were of the same index as the core. Thus the uniform total index must be sufficiently high so that the power of the core sufficiently counteracts the cortical lenses; it must be greater.

Tscherning's schematic II, not intended to be average, retains the total index conception but introduces the curvature of the second corneal surface, which he was the first to measure in the living eye. He makes the thickness of the cornea above the average of other investigators. He emphatically takes exception to the thickness of the crystalline in the Helmholtz eye. *Tscherning I* is a "simplified" approximation.

Gullstrand I (1908) introduces various new factors, including the corneal system, a compound crystalline consisting of a 'nucleus' or 'core' surrounded by cortical negative menisci, and in addition considers the normal eye as hypermetropic. He gives data for the eye in repose and accommodated suiting the possibility of adolescent youth. The *Gullstrand II* eyes are "simplified" eyes. Following the example of Listing who took advantage of the proximity of the ocular principal and nodal points respectively, it is possible to construct the corresponding "*reduced*" eyes. The mean position of each pair of points is determined and each pair of points is assumed to coincide at the mean position. We see from the last article that this process is, in essence, reducing the eye to its equivalent single surface whose radius is the distance between the mean principal point position and that of the nodal points. Comparatively little simplification ensues, and with greater accuracy we will in later calculation consider the principal point system, conceiving as explained in the last article the imaginary transference which takes place between the object side and image side cardinal points.

Included in the table are the positions of the pupils, magnification in the pupils, etc., whose importance will soon be demonstrated. The lower part of the table contains additional and incidental data for future reference.

The schematic eyes of *Mr. L. Laurance* are in this class of reduced eyes.

The vitreous humour ($n=1.3365$) have a refractive index approximately that of water (Matthiessen $n=1.3326$) and the fact that Listing's schematic reduced eye gave $r=+5.067$, $f=-15.007$ and $f'=+20.075$ led *Donders* to suggest a simplified reduced eye consisting of a single surface separating water $\left(n=\frac{4}{3}\right)$ and radius +5.0 mms. (See article *II*). The more recent schematic eyes deviate more considerably from this simplification in the direction of decreasing ocular power. On examining

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



The late Sir Wm. Crookes, O.M., F.R.S., to whose researches was largely due the evolution of Chance's 'Crookes' Glass.

The All Seasonal Need for

Chance's 'CROOKES' Glass

It requires little thought to point the need for Chance's "Crookes" Glass in summer, but its winter desirability is not quite so obvious.

Nevertheless, the winter need is both great and widespread. All who read much by artificial light, all who sew, all who concentrate their attention on any bright object or material, can be well advised to use Chance's "Crookes" Glass. We received last winter numerous letters from men and women who had found this glass wonderful in eliminating nervous headaches.

The coming winter need bring no falling-off in the demand for Chance's "Crookes" Glass. Steady publicity will be found just as fruitful now as during the hot months.

CHANCE BROS. & Co., Ltd.,

Glass Works,

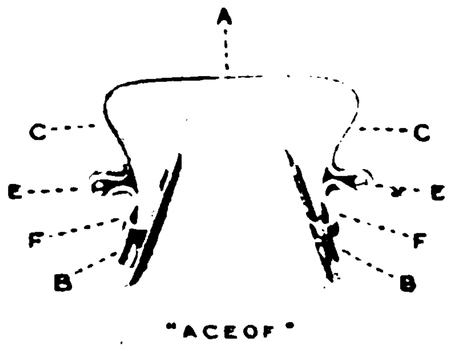
SMETHWICK, BIRMINGHAM.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Phone:—City 3225 (3 lines) *Telegrams:—Bulford, BARB. London.*

PATENT



"ACEOF"

MOUNTINGS

"ACEOF" REG.

NOTE the bridge A, with its graceful curves terminating at B.B. engaging the periphery of the lenses from C to B with a soft firm springy grip when fastened into position by the screw lugs E.E. Placquets adjustable at F.F. Simplicity is the Ace of its charm.

Made in Gold only—the first order for one dozen being supplied as follows:—Eight empty, and the remaining four made up as a fitting set in a nice case and a pair of plyers for adjusting.

"29 by 41."

The **"Aceof"** Mount lends itself to another important development—namely, what we term the Scientific Optical Size of Lenses—the 29 by 41 size.

The 29 by 41 is an ideal base measurement for a Lens size. Add or deduct as conditions require but maintain the basic shape of 29 by 41. An ideal shape governed by the muscular movement of the human eye.

Made by the firm whose Reputation for Prescription Work is:—*"Second to None."*

NEWBOLD & BULFORD, *Prescription House,* **GOSWELL ROAD, LONDON E.C.1**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

PARAXIAL SCHEMATIC EYES.

	Reference.		Unaccommodated													Accommodated						
			Listing I	Helmholtz I	Listing II	Matthiessen B	Matthiessen D	Matthiessen G	Helmholtz II	Tscherning I	Tscherning II	Gullstrand I	Gullstrand III	Laurance I	Laurance II	Helmholtz II	Matthiessen B	Matthiessen D	Matthiessen G	Helmholtz II	Gullstrand I	Gullstrand II
Indices.	Cornea.		103/77	103/77	1·3365	1·3329	1·3365	1·3430	1·3365	1·35	1·377	1·376	1·336	1·333	1·353	103/77	1·3329	1·3365	1·3430	1·3365	1·376	1·336
	Aq. & Vit.										1·3365	1·336									1·336	
	Lens.	Cortex	16/11	16/11	1·4546	1·3721	1·3854	1·3838	1·437	1·41	1·42	1·386	1·413	1·45	1·418	16/11	1·3721	1·3854	1·3838	1·4571	1·386	1·424
		Core.				1·4119	1·4150	1·4250				1·406					1·4119	1·4150	1·4250		1·406	
		Cortex				1·3721	1·3854	1·3838				1·386					1·3721	1·3854	1·3838		1·386	
Positions.	A. Cornea		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P. Do.		–	–	–	–	–	–	–	–	1·15	0·5	–	–	–	–	–	–	–	–	0·5	–
	A. Cryst.		4·0	3·6	3·78	3·6	3·6	3·6	3·6	3·6	3·54	3·6	3·6	3·6	3·6	3·2	3·2	3·2	3·2	3·2	3·2	3·2
	A. Core.		–	–	–	/	/	/	–	–	–	4·146	–	–	–	–	/	/	/	–	3·8725	–
	P. Do.		–	–	–	/	/	/	–	–	–	6·565	–	–	–	–	/	/	/	–	6·5275	–
	P. Cryst.		8·0	7·2	7·78	7·2	7·2	7·2	7·2	7·6	7·6	7·2	7·2	7·2	7·2	7·2	7·2	7·2	7·2	7·2	7·2	7·2
Radii.	A. Cornea.		8·0	8·0	7·8	8·0	8·0	8·0	7·829	8·0	7·98	7·7	7·8	8·0	8·0	8·0	8·0	8·0	8·0	7·829	7·7	7·8
	P. Do.		–	–	–	–	–	–	–	–	6·22	6·8	–	–	–	–	–	–	–	–	6·8	–
	A. Cryst.		10·0	10·0	9·58	10·0	10·0	10·0	10·0	10·0	10·2	10·0	10·0	10·0	10·0	6·0	5·6	5·6	5·6	6·0	5·38	5·33
	A. Core.		–	–	–	/	/	/	–	–	–	7·911	–	–	–	–	/	/	/	–	2·658	–
	P. Do.		–	–	–	/	/	/	–	–	–	-5·76	–	–	–	–	/	/	/	–	-2655	–
	P. Cryst.		-6·0	-6·0	-5·87	-6·0	-6·0	-6·0	-6·0	-6·0	-6·17	-6·0	-6·0	-6·0	-6·0	-5·5	-5·6	-5·6	-5·6	-5·5	-5·33	-5·33
Powers.	Crystalline Cornea	A.	42·2	42·2	44·4	41·61	42·21	42·88	42·98	42·0	47·25	48·83	43·08	42·0	42·0	42·21	41·61	42·21	42·88	42·98	48·83	43·08
		P.	–	–	–	–	–	–	–	–	-6·52	-5·882	–	–	–	–	–	–	–	–	-5·882	–
		Whole.	42·2	42·2	44·4	41·61	42·21	42·88	42·98	42·0	40·99	43·05	43·08	42·0	42·0	42·21	41·61	42·21	42·88	42·98	43·05	43·08
		A.	11·69	11·69	11·36	/	/	/	10·06	8·0	8·19	5·00	7·7	11·78	8·50	16·77	/	/	/	16·77	9·38	16·5
		A. Core	–	–	–	/	/	/	–	–	–	2·53	–	–	–	–	/	/	/	–	7·53	–
		P. Core	–	–	–	/	/	/	–	–	–	3·47	–	–	–	–	/	/	/	–	7·53	–
		Core.	–	–	–	/	/	/	–	–	–	5·98	–	–	–	–	/	/	/	–	14·96	–
		P.	19·48	19·48	18·40	/	/	/	16·77	13·33	13·54	8·33	0·83	19·63	14·16	18·29	/	/	/	18·29	9·38	16·5
	Whole		30·54	30·54	29·19	30·51	30·58	31·61	26·41	21·03	21·40	19·11	20·53	30·84	22·35	34·21	40·87	41·00	42·65	34·21	33·06	33·0
	Eye	Do.	66·67	67·29	67·74	67·07	67·74	69·16	64·52	58·82	58·38	58·64	59·74	66·67	60·0	75·36	75·99	76·99	78·62	71·48	70·57	70·54
Cardinals.	H, H		2·175	1·94	1·96	1·801	1·784	1·796	1·75	1·60	1·54	1·348	1·505	2·2	1·75	2·03	2·05	2·05	2·05	1·86	1·772	1·821
	H, H'		2·572	2·36	2·33	2·04	2·07	2·01	2·11	1·90	1·86	1·602	1·631	–	–	2·49	2·51	2·31	2·53	2·26	2·086	2·025
	H, N		7·24	6·96	7·07	6·76	6·76	6·76	6·96	7·30	7·30	7·08	7·13	7·2	7·5	6·51	6·44	6·44	6·42	6·57	6·53	6·59
	H, N'		7·64	7·37	7·44	7·00	7·05	6·97	7·32	7·60	7·62	7·33	7·26	–	–	6·97	6·90	6·70	6·90	6·97	6·85	6·78
	Length		22·6	22·2	22·2	21·82	21·82	21·82	22·82	24·6	24·75	24·0	24·0	22·2	24·0	22·2	21·82	21·82	21·82	22·82	24·0	24·0
	f		-15·00	-14·86	-14·77	-14·91	-14·77	-14·46	-15·5	-17·0	-17·13	-17·06	-16·74	-15·0	-16·5	-13·27	-15·16	-13·06	-12·72	-13·99	-14·17	-14·18
	f'		20·08	19·87	19·88	19·87	19·75	19·42	20·71	22·7	22·89	22·78	22·36	20·0	22·25	17·76	17·55	17·45	17·09	18·69	18·93	18·94
	n		5·08	5·01	5·11	–	4·98	–	5·21	5·7	5·76	5·72	5·62	5·0	5·75	4·49	–	4·39	–	4·70	4·76	4·76
Red.d Eyes	Mean	H	2·37	2·15	2·14	1·92	1·92	1·90	1·93	1·75	1·70	1·47	1·56	2·2	1·75	2·26	2·28	2·18	2·29	2·06	1·93	1·91
		N	7·44	7·15	7·25	6·88	6·90	6·86	7·14	7·45	7·46	7·20	7·19	7·2	7·5	6·73	6·67	6·57	6·66	6·77	6·67	6·68
		n	5·07	5·0	5·11	4·96	4·98	4·96	5·21	5·7	5·76	5·72	5·63	5·0	5·75	4·47	4·39	4·39	4·37	4·71	4·74	4·77
Pupils.	Position. Ent.		–	–	–	–	–	–	3·05	–	–	3·0	–	–	–	–	–	–	–	2·67	3·05	–
	Do. Exit		–	–	–	–	–	–	3·70	–	–	3·67	–	–	–	–	–	–	–	3·30	3·65	–
	Magnif.n		–	–	–	–	–	–	·923	–	–	·909	–	–	–	–	–	–	–	·941	·917	–
	Ang.r Rats		–	–	–	–	–	–	·811	–	–	·822	–	–	–	–	–	–	–	·795	·816	–
	Refract.n		0	0	0	–	0	–	0	0	0	1·01	0	0	0	-6·46	–		–	-6·46	-9·6	-9·6
	Obj Point		∞	∞	∞	–	∞	–	∞	∞	∞	1000	∞	∞	∞	-152·5	–		–	-152·46	-102·3	-100·8
Reduced Thickness.	Cornea		–	–	–	–	–	–	–	–	–	·363	–	–	–	–	–	–	–	–	·363	–
	Aqueous		3·0	2·7	2·8	2·70	2·69	2·68	2·69	2·71	1·79	2·32	2·69	2·70	2·70	2·39	2·40	2·39	2·38	2·39	2·02	2·39
	A. Cortex		–	–	–	/	/	/	–	–	–	·394	–	–	–	–	/	/	/	–	·486	–
	Core		–	–	–	/	/	/	–	–	–	1·72	–	–	–	–	/	/	/	–	1·688	–
	P. Cortex		–	–	–	/	/	/	–	–	–	·458	–	–	–	–	/	/	/	–	·486	–
	Lens		2·75	2·75	2·75	/	/	/	2·51	2·84	2·84	–	2·55	2·48	2·54	2·75	/	/	/	2·78	–	2·81
Positions H, H' Parts.	A. Cornea		0	0	0	0	0	0	0	-·13	-·0496	-·0496	0	0	0	0	0	0	0	0	-·0496	0
	P. Do.		0	0	0	0	0	0	0	-·14	-·0506	-·0506	0	0	0	0	0	0	0	0	-·0506	0
	A. Cryst.		6·31	5·90	6·09	5·28	5·28	5·28	5·72	6·0	5·96	5·68	5·85	5·70	5·75	5·16	5·09	5·11	5·09	5·19	5·14	5·2
	P. Cryst.		6·58	5·78	6·34	5·46	5·36	5·44	5·93	6·2	6·14	5·81	5·85	5·94	5·92	5·40	5·31	5·10	5·31	5·38	5·25	5·2
Red.d	Separn.		4·7	4·4	4·54	3·96	3·95	3·95	4·28	4·49	4·56	4·29	4·30	4·28	4·31	3·86	3·82	3·82	3·79	3·88	3·89	3·89

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

the table we see the main amendment has taken place at the crystalline lens which has been changed with time +30.54 (Listing), 26.41 (Helmholtz II) +21.40 (Tscherning) and +19.11 (Gullstrand).

We observe one other feaure, the action of the second corneal surface is too great to be ignored.

A rough analysis of the experimental records of measurements by various investigations recorded by Helmholtz and Tscherning is given in the following table. Simple averages only have been taken which give an idea of the 'spread' in practical measurements. The 'means' are interesting for comparison with the schematic eyes in the preceding table.

	Radii.			Positions.	
Reference.	Cornea.	A. Cryst.	P. Cryst.	A. Cryst.	P. Cryst.
No. of Eyes.	499	22	22	21	20
Mean.	7.66	10.0	6.3	3.57	7.36
Mean diff. from mean of means.	.16	.5	.25	.12	.19
Maximum Spread.	.86	2.61	1.16	.37	.80

All measurements are in millimeters. Both the mean difference from the mean and the maximum spread refer to the means of each investigator. If individual eyes be taken into account considerable variations occur.

The difficulties of measurement and the precautions necessary to measure the internal surfaces are very great, especially the back surface of the crystalline and as Dr. Tscherning points out great care must be taken in the interpretation of results, when investigating the mechanism of accommodation for example. It will be noticed that, in this table, greatest variations of measurement occur in the measurement of the anterior crystalline radius and the posterior crystalline position.

Influence of Difference of Radius on Power.

If D_0 be the power of any average ocular refracting surface (*i.e.*, schematic surface power), and D_1 the power of the same surface but differing slightly in radius, then

$$D_0 - D_1 = (n'-n)\left(\frac{1}{r_0}-\frac{1}{r_1}\right) = \frac{n'-n}{r_0}\left(\frac{r_1-r_0}{r_1}\right) = D_0\frac{r_1-r_0}{r_1}$$

This will be *approximately* equal to $\frac{D_0}{r_0}(r_1-r_0)$

If a difference of radius (r_1-r_0) of 0.1 mm. be considered for each surface in turn, we have the difference in power due to a +0.1 mm. difference in radius is equal to $0.1\times\frac{D_0}{r_0}$ and will amount to (assuming the Gullstrand schematic eye)

(*a*) Anterior Cornea $\frac{0.1\times48.8}{7.7}=.63$ Dp.

(*b*) Posterior Cornea $\frac{0.1\times5.9}{6.8}=-.09$ Dp.

(*c*) Anterior Crystalline $\frac{0.1\times5.0}{10}=.05$ Dp.

(*d*) Posterior Crystalline $\frac{0.1\times8.33}{6.0}=-.14$Dp.

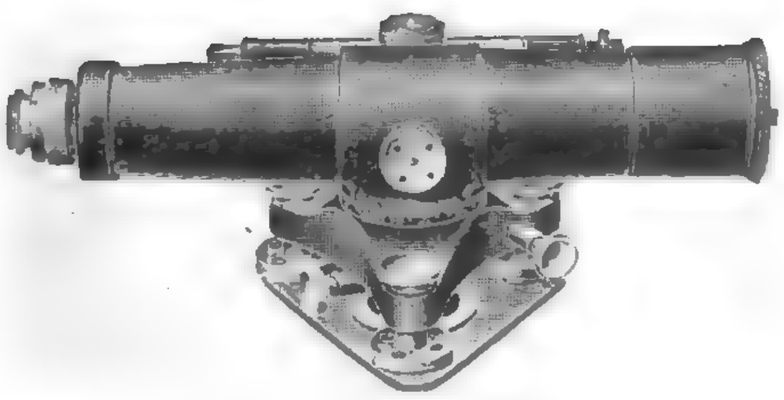
These figures have a bearing on the action of each surface in causing an optical defect, e.g., curvature ametropia or astigmatism. As an example, consider a keratometer reading of the anterior corneal surface which shows a difference in power of .63 Dp. between two meridians at right angles. If the back corneal surface has a like difference of radius in the same meridians, the subjective reading which includes refractions at both surfaces will be some function of 0.54 as compared with the same function of .63.

Or again the vexed question of astigmatic accommodation probably introducing a difference of radius at the anterior surface of the crystalline, for .1 mm. difference of radius would contribute .05 Dp. when the eye is about its rest position. At accommodation this figure would be .17 Dp. It will be well to observe at this stage, the small refraction at this surface at which occurs the principal accommodation change.

Dr. Tscherning gives the laminated crystalline structure additional uses, the reduction of intensity of the 'ghost' reflexion images by the ocular refracting surfaces and a necessary function in his theory of accommodation. That a nucleus is a distinct constituent of the living crystalline has been reported by Demicheri (see Tscherning, Chapter 2). Hess claims that the index varies gradually in the young eye but with advancing age the core shows an abrupt change. Bowman suggests another variation exists across the axis. Gullstrand who does not agree with the Tscherning theory of accommodation points out the necessity of a laminated structure to explain the accommodative effort of an adolescent youth.

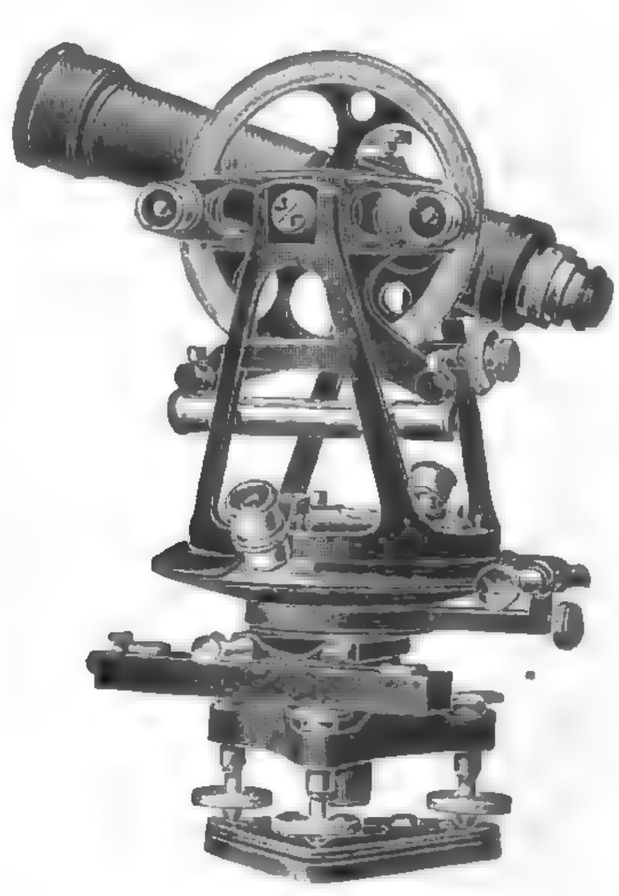
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

CASELLA'S
Surveying Instruments



10-inch
Standardized
DUMPY LEVEL
£18. 15. 0.

5-inch Tacheometrical
THEODOLITE
£48. 0. 0.



Liberal Discounts
to the Trade

Pamphlets on Application.

C. F. CASELLA & Co. Ltd.
49 & 50 PARLIAMENT STREET, S.W.1

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Shur-on Glasses

The Shur-on Reputation

Shur-on eyeglasses and spectacles are preferred by thinking people because they realise that an organisation which has, for upwards of half a century rigidly adhered to a manufacturing policy based on "Quality Beyond Question" *must* turn out a product which ensures their getting a brimming measure of honest value, as measured in terms of dependability, comfort, becomingness and wearability.

If your wholesaler cannot supply you with Shur-on products, send us his name.

Shur-on Optical Co.,

Rochester, N.Y., U.S.A.



A Popular Shur-on.

Noted for its becomingness and serviceability. A good frame which will be a good-will builder for you. The shoes are unordinarily stiff; the straps are reinforced for added rigidity and strength; shanks are specially processed for extra toughness; joints are all electrically soldered.

Quality Beyond Question Since 1864

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Eye Changes Due to Age.

By CHARLES H. HOLLIS, F.B.O.A., F.S.M.C.

With the increase of years, almost every structure of the eye undergoes some modification. Some of these anatomical changes may alter the refraction of the eye, while others may cause an actual diminution of the visual acuity.

The eye of a new-born child is much smaller than in an adult, the axis measuring somewhere in the region of 17 mm. as against 24 mm. in the adult. Tscherning (9). The organ of sight attains its full development in 12 to 18 years. Landolt (5). This growth is probably proportional to the amount of near work done.

The eye is usually hypermetropic at birth, but as it developes the hypermetropia tends to disappear.

In youth, the conjunctiva of the eyelids is smooth and glistening, but it becomes rougher and redder with increasing age.

In the cornea, the arcus senilis is a typical symptom of age. It appears at first, as a milky looking arc, but later on the whole circle is completed. Found near to the sclero-corneal junction, it is separated from the limbus by clear corneal tissue. The opacity is from 1 mm. to 1.5 n.m. broad, and reflects light perfectly. Owing to its proximity to the sclero-corneal junction, it does not in any way interfere with vision.

Donders (1) found that the cornea becomes more convex with age. I do not know if this has been verified by other investigators. Again, the form of the cornea may change, so that from adult life on, astigmatism against the rule becomes more and more common. E. Fich (3). This is due to an increase in the tension of the eye from natural causes. That the maximum curvature of the cornea tends to pass from the vertical to the horizontal meridian when the tension of the eye is raised, is proved by observation on glaucomatous eyes. The researches of Eissen (2) on rabbits eyes confirm this result.

The depth of the anterior chamber of the aqueous becomes less owing to an enlargement of the crystalline lens.

The iris of the newly born child is blue. Due to the fact that the stroma of the iris contains no pigment at this period of life. The retinal layer of the iris, however, is rich in pigment at birth, and this pigment shows through the thin and translucent stroma. Later on, the stroma becomes thicker and pigmented and the amount of pigment in it determines the colour of the iris.

At birth, the average diameter of the pupil is from 2.5 mm. to 3 mm. and gradually increases till the sixth year. It then remains stationary till the 20th year, after which it diminishes little by little up to the 60th year, when the amplitude of its movements is diminished. In very old people the pupils are in a state of almost continual myosis. Magitot (6).

This gradual diminution in the pupillary diameter is due to a reduction in the energy of the sympathetic, while there is a selerosis of the walls of the vessels of the iris, and rigidity of its stroma. Swanzy (8). A small part of this is only an apparent diminution owing to the fact that since the anterior chamber is more shallow in old age, the pupil is seen under a less magnification. It plays a beneficient part in presbyopia, where it reduces the size of the circles of diffusion on the retina and thus allows reading matter to be seen more distinctly. The small pupil cuts off the rays passing through the more peripheral part of the cornea and a certain degree of astigmatism may produce less disturbance of vision. Donders (1).

The crystalline lens is considerably modified by age. According to Priestly Smith (7) the average weight of the lens continually increases at the rate of about 1.5 milligrammes each year, and the volume of the lens increases at the rate of about 1.5 cubic mm. each year.

The anterior surface also becomes slightly flattened.

The central portion of the lens, the nucleus, is of a firmer consistence than the cortex and is continually increasing at the expense of the latter. In youth, the nucleus is quite small, but in old age it has increased to such an extent that the cortex has completely disappeared. Juler (4). This change, together with the slight flattening of the anterior of the lens, reduces the dioptric power of the eye, so that the eye previously emmetropic becomes hypermetropic (acquired hypermetropia).

On examining the lens by oblique illumination, we find that the old lens reflects much more light than the young one, and it appears yellow. This is due to its relatively higher index of refraction. Since the cortex has now

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

been replaced by the nucleus, having a higher index, the difference between the index of refraction of the aqueous humour and that of the lens is now greater, and more light is reflected from the lens surface.

The gradual hardening of the lens necessitates an ever increasing effort on the part of the ciliary muscle to perform the function of accommodation. Eventually this effort of accommodation causes asthenopia, and lenses are required for near vision (presbyopia). The ageing of the lens may produce or relax an astigmatism. Landolt (5).

If an astigmatism has been partially or totally corrected by an astigmatic accommodation, then this correction will disappear when the ciliary muscle can no longer produce the required deformity on the hardened lens.

The vitreous humour loses some of its perfect clearness at an advanced period of life. Donders (1). It becomes richer in membranes and in consequence muscæ volitantes make their appearance.

There appears to be a diminution of the retinal transparency. Very often, we are able to distinguish by means of the ophthalmoscope (direct method) some inconspicuous pathological changes at the macula. Sometimes the change appears as a light or dark mottling, with yellowish or yellowish-red spots. At other times there may only be an increase in pigment. These changes are always greatest at the fovea. We generally find that the fovea is yellowish in colour surrounded by the darker pigment changes. The visual acuity is here considerably reduced. Sometimes the ophthalmoscope reveals a senile pigmentation at the periphery of the retina.

The pigment appears in the form of fine dots or lines forming five or six-sided figures. Vision may be quite good.

Occasionally, in elderly people, we see a number of small round or egg-shaped bright patches either in the periphery of the retina, or in the neighbourhood of the optic disc. They reflect light strongly, are yellowish white in colour, and form nodule-like prominences (hyaline bodies in the vitreous layer of the choroid). These bodies do not usually cause any visual disturbances, as they are remote from the neighbourhood of the macula.

References in Paper.

1. Donders, "Accommodation and Refraction of the Eye," 1864.
2. Eissen, See Tscherning, "Physiologic Optics," 1904.
3. E. Fich, "Diseases of the Eye," 1896.
4. Juler, "Ophthalmic Science and Practice," 1904.
5. Landolt, "Refraction and Accommodation of the Eye."
6. Magitot, "L'Iris," 1921.
7. Priestly Smith, "Trans. Oph. Soc.," vol. 3.
8. Swanzy, "Handbook of Diseases of the Eye."
9. Tscherning, "Physiologic Optics," 1904.

The Refractory Iris.

The Vienna School of Ophthalmology recently celebrated the seventieth birthday of Prof. Ernst Fuchs in a special number of their medical journal. Among the numerous articles on ophthalmic subjects is one purporting to answer a question which must often have puzzled those who do refraction work. Why is it that the action of homatropine as a mydriatic, though entirely satisfactory in the great majority of cases, is in a few uncertain? The answer suggested is that in the eyes of certain people the anterior surface of the iris is more or less devoid of the crypts that are normally present, that in these cases the surface is comparatively smooth, and further, that these exceptional irides are exclusively found in brown eyes. This formation of the iris, though it cannot prevent the absorption of atropine, may partially or in exceptional cases completely prevent the absorption of homatropine.

Dr. G. Guist, the writer of the article, found that in 24 out of 9,500 patients homatropine completely failed to paralyse the pupil, whereas atropine succeeded. Whether or not the reason suggested by him is the true one should be easily ascertainable (says the 'Lancet,' from which this note is quoted) if the attention of a sufficient number of workers at refraction is directed to the subject. Paralysis of the pupil, of course, is not the same thing as paralysis of the accommodation, but the two conditions are intimately connected. If the explanation offered is correct, stubbornness to homatropine should be far commoner among negroes than among white people, and, so far as is known, this appears to be the case. In confirmation of his theory the author cites three cases of heterochromia in which the blue iris was easily paralysed by homatropine, whereas the brown one remained resistant, or nearly so, to the drug.

Matter intended for the current weeks' "Optician" must reach this office on the Tuesday morning preceding publication.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE CASE

FOR TORTOISESHELL SPECTACLES.



SUPPLIED IN A CHOICE
RANGE OF LEATHERS.

The MAXIMUM OF UTILITY with the MINIMUM OF INCONVENIENCE.

NEWBOLD & Co.,
P. & S. NEWBOLD,
72 and 74, GRAY'S INN ROAD, LONDON, W.C.1

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

ESTABLISHED 1851. — *Telephone—Central 10997.*

WHOLESALE  & EXPORT



ROBERT MARTIN & SON,

W. H. MARTIN,
J. E. MARTIN.

7, LOVELL'S COURT,
PATERNOSTER ROW, LONDON, E.C.4

Wholesale Manufacturers of HAND MADE

LORGNETTES (in Twenty different designs)
SPECTACLES . . . .
FOLDING EYEGLASSES .
ASTIGMATIC CLIPS . .

In GOLD, SILVER, Tortoiseshell, Real Horn, Non-Inflammable Imitation Shell, Platinum and White Gold.

ROLLED GOLD, best English made Spectacles, Astig Clips and Readers. Extensive stocks of LENSES. Sphero, Sphero Cyls, Meniscus, Torics, &c., and finest quality PEBBLE LENSES.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

AN OPTICAL NOMOGRAM.

By J. A. TOMKINS, A.R.C.S. (Lond.), F. Inst. P., Technical College, Bradford.

Introduction.

Various graphical methods for the solution of optical problems have been given from time to time in text-books and papers. Of these, some depend upon the drawing through a given object-point of certain rays the intersections of which, after reflexion or refraction, give the corresponding image point. Others are purely geometrical constructions based upon the principles of metrical or projective geometry in which the rays themselves are not drawn though certain lines may be interpreted optically as rays of light.

A construction based upon one of the latter methods, and applicable to concave mirrors, was given in W. S. Aldis's "Geometrical Optics." This was extended by Prof. E. H. Barton ('Phil. Mag., 1896) to convex mirrors and thin lenses, and a little later, in the same journal, Mr. R. S. Cole described a closely allied method of determining the equivalent points of a pair of separated lenses. In 1903, the present writer constructed the simple mechanical device described below for the solution of various optical and other problems. In 1908, Dr. H. S. Allen, in a paper read before the Physical Society, applied Mr. Cole's method to the case of any combination of coaxial refracting surfaces.

In 1911, Dr. R. S. Clay, in his interesting and suggestive "Treatise on Practical Light." employed the same method which he extended to the graphical determination of the cardinal points of any system of centered spherical surfaces.

In 1912, Dr. A. S. Percival read a paper before the Optical Convention in which the principle was again described together with an application for finding graphically the cardinal points of a thick lens which he attributed to Prof. R. A. Sampson.

At the same time, in the Loan Collection of the Optical Convention, Mr. E. M. Nelson exhibited an instrument, based on this principle, for solving the equation $\frac{1}{F} = \frac{1}{f} \pm \frac{1}{f_1}$. In the description of this he stated that the instrument, though seldom seen, had been reinvented several times, that the name of the original author and its date were unknown to him and that the instrument, as shown, was made from a drawing by him about sixteen years before. Finally, on December 10th, 1920, Mr. C. F. Smith described in this Journal a device somewhat similar to that of Mr. Nelson, in which, however, the stretched thread employed by the latter was replaced by a thin ruler. This method Mr. Smith attributed to Sir Howard Grubb. He pointed out its utility to the designers of optical instruments for eliminating preliminary calculations before preparing the final calculations and drawings. As the device can be rapidly and conveniently employed for many purposes other than the simple ones described, the writer proposes to give a fuller description of it in the hope that it may be found useful by optical designers and others.

Although the apparatus and certain of the methods have in some form, been previously described, they have nevertheless, all been arrived at independently by the writer.

Theory of Method.

Let AB be any straight line passing through the points A and B on the axes OX and OY, making intercepts $OA = a$, $OB = b$ respectively on these axes (fig. 1).

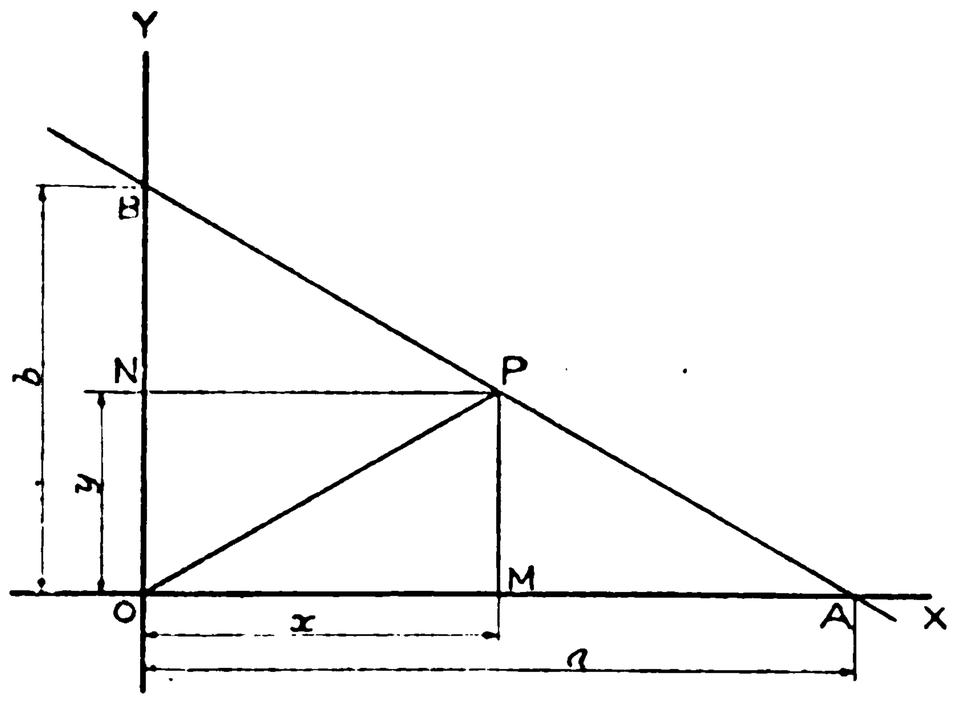


FIG. 1.

On this line take any point P, the co-ordinates of which are x and y and join OP.

Then $\Delta POB + \Delta POA = \Delta BOA$.

whence $x\,b + y\,a = a\,b$, or

$$\frac{x}{a} + \frac{y}{b} = 1 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

the well-known "intercept" form of the equa-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

tion of a straight line. This is true for any axes but they are, for convenience, taken as rectangular.

Hence if x and y be the co-ordinates of a fixed point P through which a straight line passes the intercepts a and b on the two axes for all positions of the line will satisfy equation (1).

The optical equation upon which the method is based and which is of the same form as (1) is

$$\frac{f}{x} + \frac{f'}{x'} = 1 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

where x and x' are the distances of a pair of conjugate foci from the principal points, while f and f' are the focal lengths of the object and image spaces or the first and second focal lengths respectively. This equation is applicable to all systems of centred spherical surfaces.

If, therefore, we take on a diagram a point P, the co-ordinates of which are the focal lengths f, f' and draw a straight line through it, the intercepts on the axes will satisfy equation (2) and will, therefore, give the values x, x', of a pair of conjugate focal distances for the given system. Hence, if any three of the quantities x, x', f, f', are given the fourth is easily found by this method (fig. 2). In the case of a mirror or system of refracting surfaces in which the first and last media are the same $f=f'$ and the equation reduces to the simpler form.

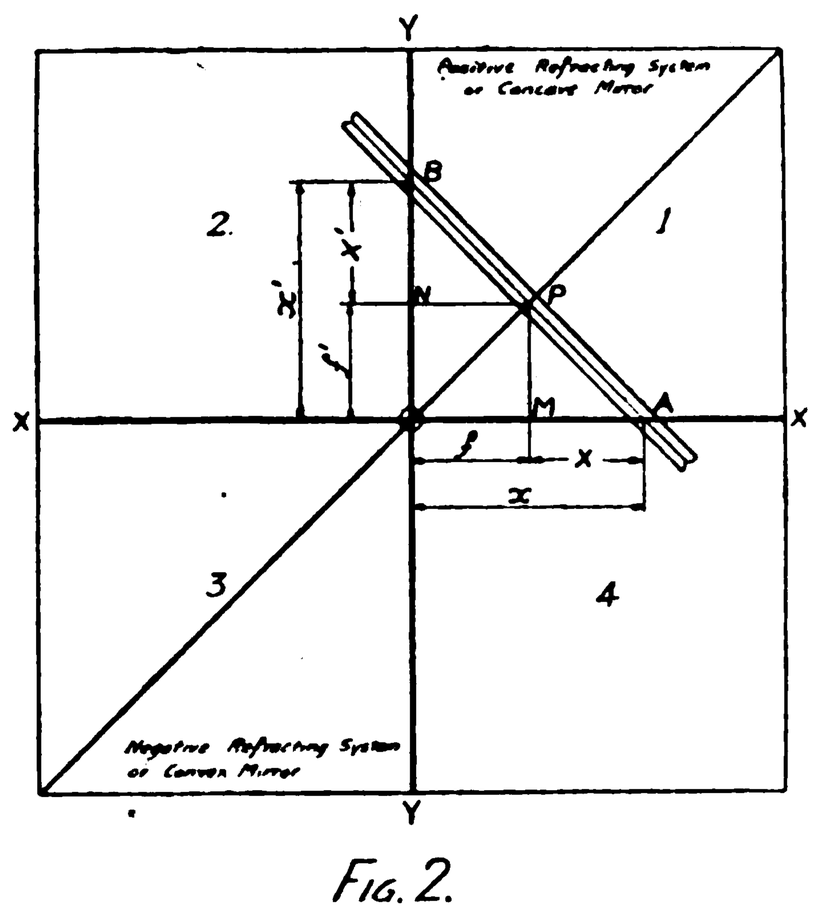


FIG. 2.

$$\frac{f}{x} + \frac{f}{x'} = 1$$

or the more usual

$$\frac{1}{x} + \frac{1}{x'} = \frac{1}{f} \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

The convention adopted here with regard to sign is that *real* object and image distances are considered positive. In refraction, therefore, positive object distances are those measured *against*, and positive image distances those measured *with*, the incident light. Thus a given distance may be either positive or negative according to whether it refers to an object or an image. With this convention the equations are of the same form for both reflexion and refraction and this simplifies the operations to be described. A useful summary of the various sign conventions adopted by optical writers was given by Mr. Swaine in this Journal on May 27th, 1921.

It is to be noted that the method is but a particular case of the general relation between two collinear projective ranges of points, the object-points and the image points on the axis constituting two such ranges. Further, that these equations apply only to paraxial rays—*i.e.*, rays lying indefinitely near to the principal axis—and that, therefore, the constructions based on them, are subject to the same limitations.

Description of Apparatus.

The apparatus is practically the same as that described by Mr. Smith, viz., a large sheet of squared paper pinned on a drawing board and having drawn on it two rectangular axes XOX, YOY, marked off according to the usual convention as to sign. In place, however, of the thin rule, the edge of which rocks against a pin, a strip of transparent celluloid is employed. On this is drawn throughout its length a fine straight line in which are drilled at intervals several holes through which a pin will just fit. The strip can thus be pinned accurately at any given point and the line turned into any required position. It is convenient also, to have a V-notch at each end of the line so that it may be quickly adjusted, by holding a notch against the pin, in those cases where a reading is required on one side only of the pin. For certain purposes it is necessary to move the line parallel to itself. In such cases the strip may be replaced by some form of parallel rule or a large set square. In general, however, the fine line is to be preferred to the edge of a rule, as, by reason of symmetry it can be set and read with greater accuracy. Readings can be made with fair accuracy to three or four significant figures. Since, on the sign convention adopted, the two focal lengths have the same sign, positive or negative, the point P (f, f') will always lie in either the first or the third quadrant being in the former for a concave

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

W.H.T.

Rx WORK

WE DO NOT SACRIFICE ACCURACY FOR SPEED, BUT COMBINE BOTH,

WHICH MUST NATURALLY RESULT IN MAKING

"THAT PRESCRIPTION"

WORTHY OF THE TIME OCCUPIED.

OUR METHODS AND ORGANISATION

ENABLE US TO MEET ALL DEMANDS AND

OUR EXPERIENCE IS AT YOUR SERVICE.

Ophthalmic Supplies

OF EVERY DESCRIPTION.

Samples and Prices on Application.

WALTER H. THOMPSON

66 HATTON GARDEN, LONDON, E.C. 1.

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

WHOLESALE TRADE ONLY.

Head Office:
66 and 67, EDWARD ST. PARADE,

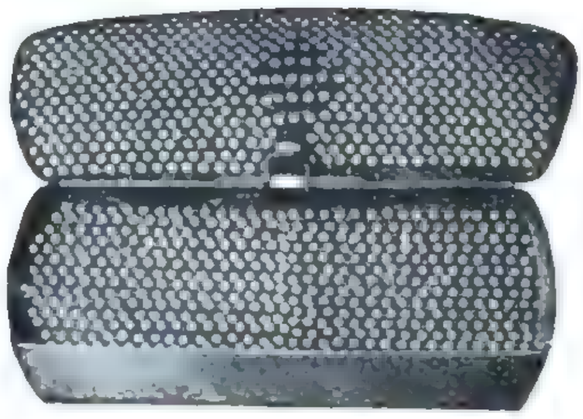
W. Smythe & Co. Ltd. Birmingham.

Branch Works—HOCKLEY and WALSALL.

Patent Optical Case Manufacturers

Telephones: 5587-2354 CENTRAL. Telegrams & Cables: "NOWATE, BIRMINGHAM."

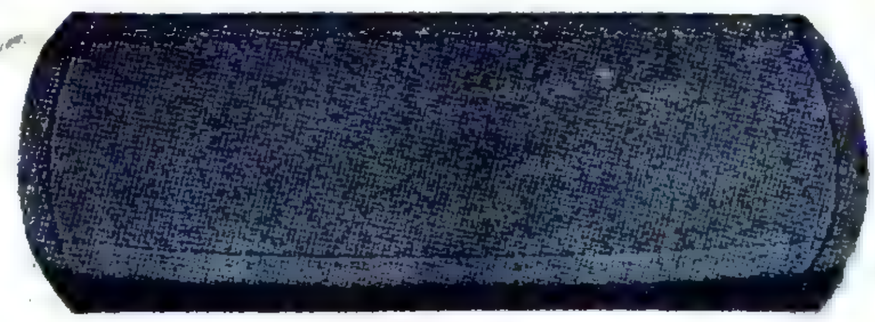
The Patent "NOWATE" Body →



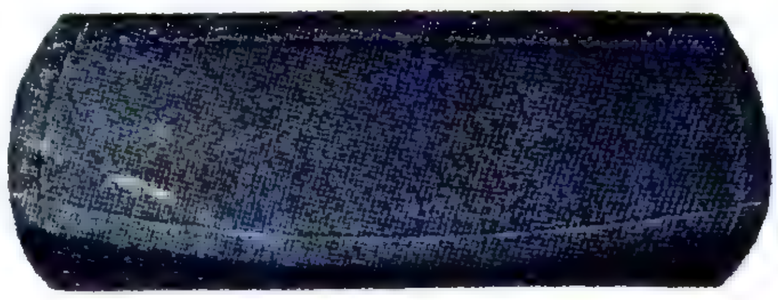
Advantages:

Light as Aluminium and Cheaper.
Stronger than Aluminium and Steel Bodies.
Leather and Lining does Not Peel Off.
Specially Suitable for Export and Hot Climates.

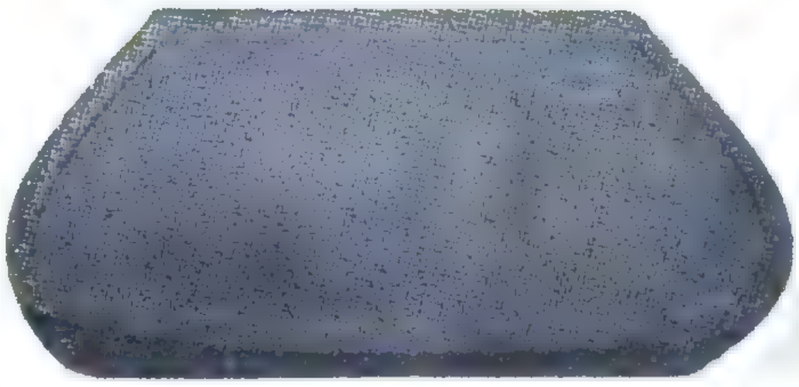
Patent Metal Spring Lid.



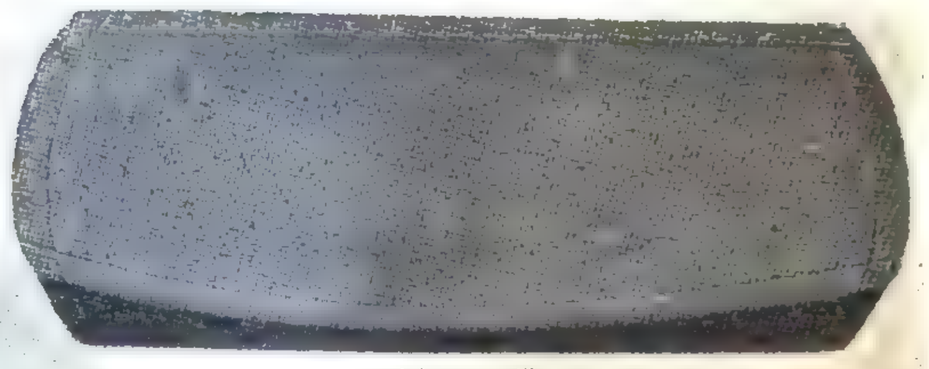
MODEL 5
FINGERPIECE EXTRA LARGE CURLSIDE 2.1.0. EYE



MODEL 4
FINGERPIECE. BOWSPRING RIMLESS ORDINARY SPIRAL. 2.1.0 EYE.

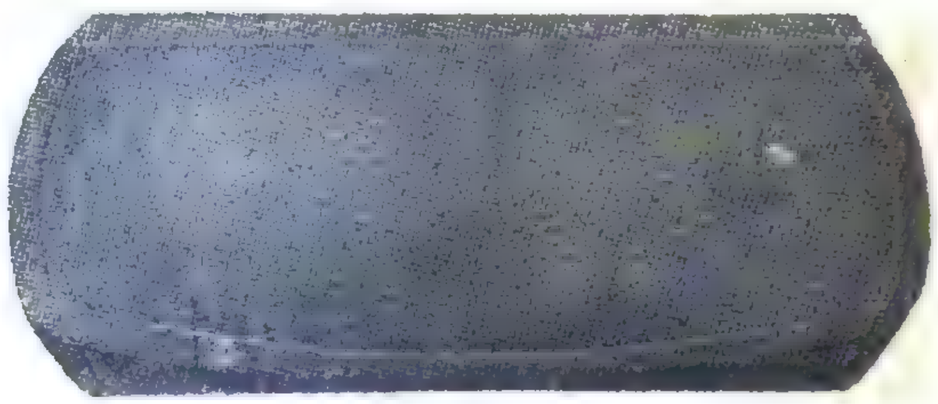


MODEL 6
FRENCH ASTIG. PERFECTION and CANADIAN FOLDERS



MODEL 3
CURLSIDE 00 EYE. 64 & 66 m/m RD

MODEL 1
ORDINARY SPIRAL TRIPLE BAR 2.1.000 EYE



MODEL 7
ROUND EYE

ILLUSTRATIONS HALF-SIZE. COMPETITIVE PRICES.

Also Makers of Frogmouth and Soft Leather Cases. Write for List and Prices.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

mirror or positive refracting system and in the latter for a convex mirror or negative refracting system. The convention adopted by Mr. Smith requires the use of all four quadrants.

In what follows the strip or straight edge will be termed the "cursor" and the point P, the "pole" of the diagram for the given surface or system. This arrangement, while useful for solving many optical problems is, perhaps, of greatest use for tracing rapidly and accurately, without calculation or drawing, changes produced in the properties of an optical system by changes in the character or separation of its components.

Applications of Method.

We shall now give a few examples of the use of this method and apparatus.

I.—*Proofs of Formulæ.*

Several relations, usually established in other ways, can be derived very simply from this diagram.

(1) *Newton's Equation.*

By similar triangles (fig. 2) we have

$$\frac{NB}{NP} = \frac{MP}{MA}$$

$$\text{or } \frac{X'}{f} = \frac{f'}{X} \therefore XX' = ff'$$

or, if $f=f'$, $XX' = f^2$ ... ... (4)

(2) *Transverse or Lateral Magnification.*

This is the ratio of conjugate lengths, perpendicular to the optic axis, in the image and object spaces respectively. It will, in general, depend on the meridian but in the case of a spherical system, will be the same for all meridians.

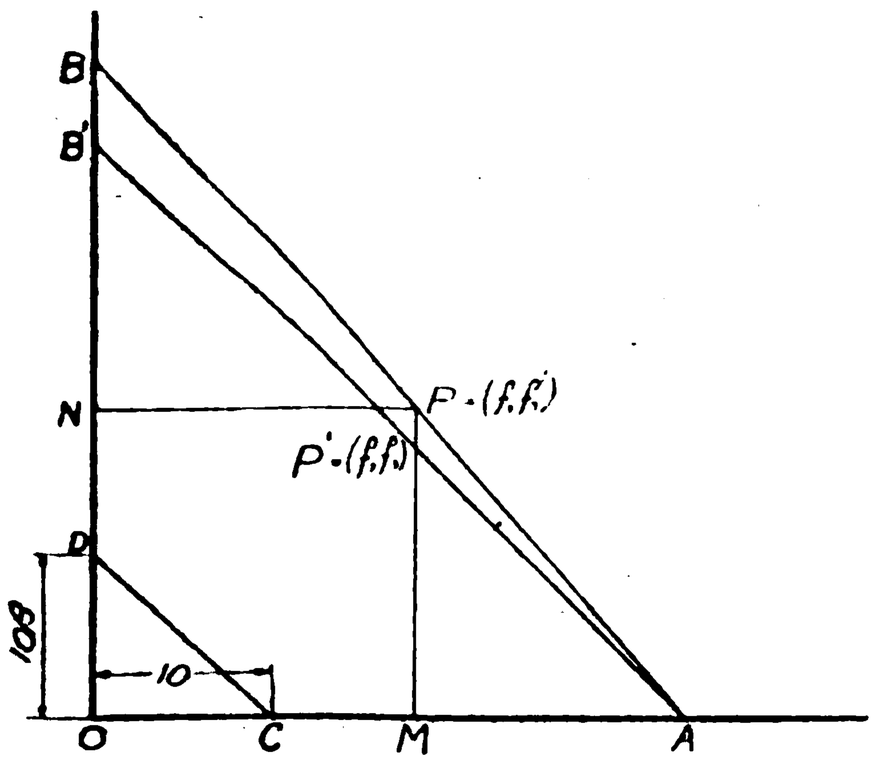


Fig. 3.

Assuming any one expression for the magnification, *e.g.* $\beta = \frac{x'}{x} \cdot \frac{\mu}{\mu'} = \frac{x'}{x} \cdot \frac{f}{f'}$ others readily follow from the diagram together with a simple method of reading it off directly. Referring to fig. 3, let OA and OB represent the given object and image distances for a system of which the focal lengths are f, f'.

Since $\frac{x'}{x} = \frac{OB}{OA}$ we obtain β by changing OB in the ratio of f' to f, which can be done by drawing AB' through the point $P'=(f,f')$.

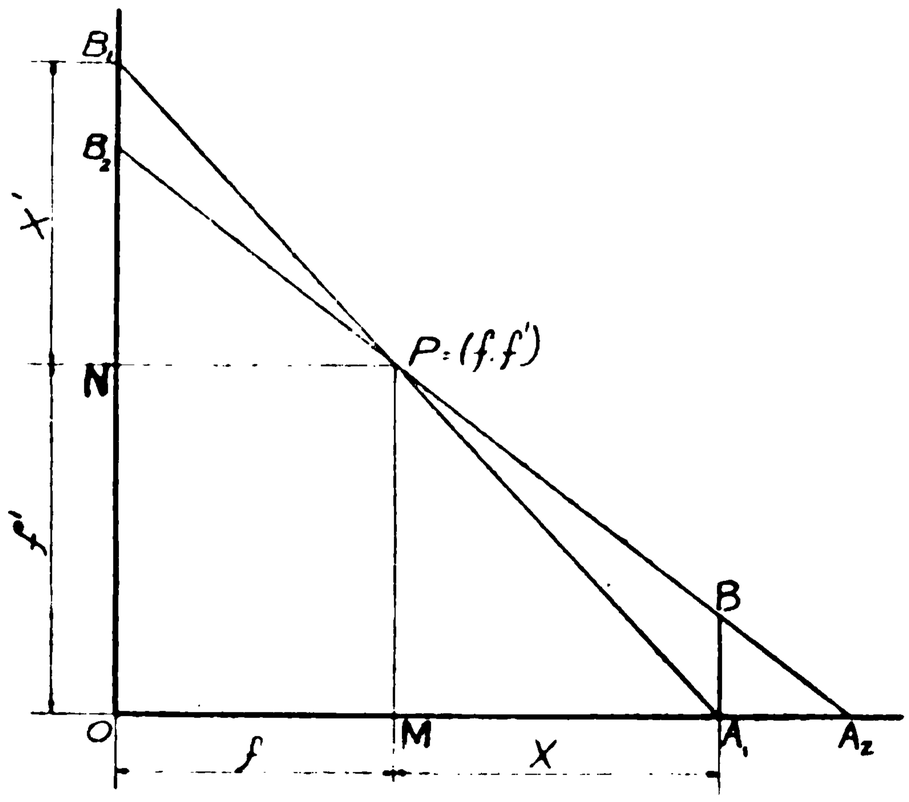


Fig. 4

Then $\beta = \frac{OB'}{OA}$

By similar triangles

$$\beta = \frac{OB'}{OA} = \frac{MP'}{MA} = \frac{NP}{MA} = \frac{NB}{MP}$$

$$\text{or } \beta = \frac{f}{X} = \frac{X'}{f'} \quad \ldots \ldots \ldots \quad (5)$$

Instead of actually finding the ratio of these lengths β may be obtained by drawing CD through division 10 on OX parallel to AB'. The intercept OD on OY will then be 10β. In the particular case in which $f=f'$, CD is drawn parallel to AB. As regards sign, image inversion is here considered positive.

(3) *Axial or Longitudinal Magnification.*

This, which is also called Depth-Magnification and, by Clerk Maxwell, the Elongation is the ratio of conjugate lengths on the principal axis in the two spaces. Expressions for it can be obtained very simply. In fig. 4, let A_1 and B_1 represent a pair of conjugate foci on the principal axis at distances, x, x' respectively from O and A_2, B_2, a pair of adjacent foci. Then the axial magnification at the points A_1 and B_1

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

$$a_1 = \frac{dx'}{dx} = \text{limiting value of } \frac{B_1 B_2}{A_1 A_2}$$

Draw A_1 B parallel to OY.

Then by similar triangles.

$$\frac{B_1 B_2}{A_1 B} = -\frac{P B_1}{P A_1} = -\frac{f}{X}$$

$$\text{and } \frac{A_1 B}{A_1 A_2} = \frac{M P}{M A_2} = \frac{f'}{X} \text{ (in limit)}$$

Multiplying these two equations we get

$$a = -\frac{ff'}{X^2} = -\frac{X'}{X} \text{ by (4)} \quad \ldots \quad \ldots \quad (6)$$

again, by equation (5).

$$X' = f'\beta \text{ and } X = \frac{f}{\beta}$$

$$\therefore a = -\frac{f'}{f}\beta^2 = -\frac{\mu'}{\mu}\beta^2 \quad \ldots \quad \ldots \quad (7)$$

In general, where A_1 A_2 and B_1 B_2 are finite lengths, it is easy to show that

$$a = -\frac{\mu'}{\mu}\beta_1 \beta_2 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (8)$$

where β_1 and β_2 are the transverse magnifications corresponding to A_1 and A_2 respectively.

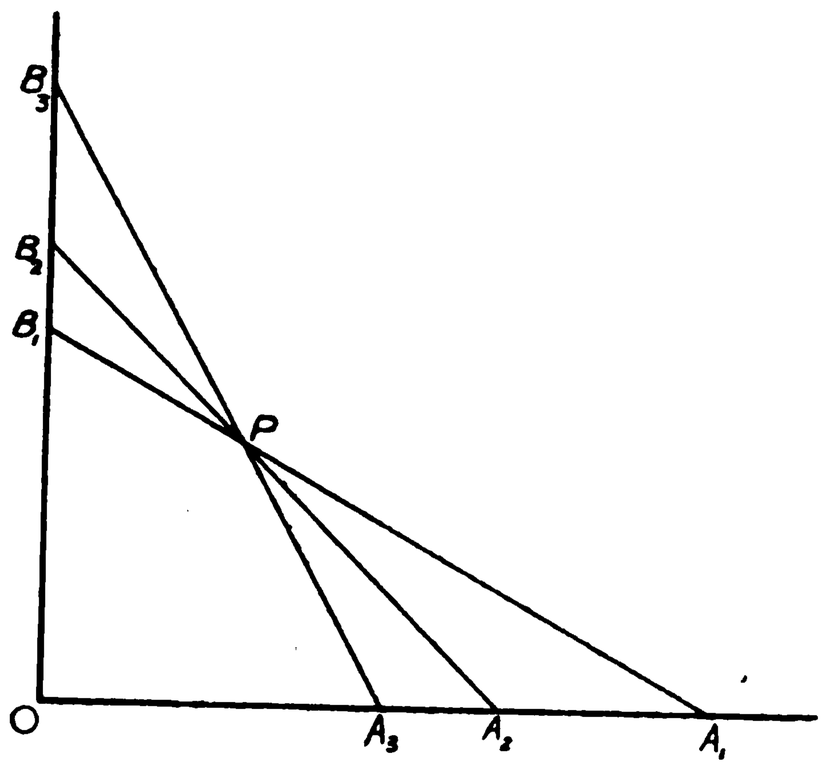


FIG. 5.

(4) *Minimum distance between object and real image formed by a lens system.*

In the ordinary case in which $f=f'$, this minimum distance may be seen from the diagram (fig. 5) to be $4f \pm t$, where t is the distance between the principal planes, the "equivalent thickness" or "optical interval."

For let A_1, B_1, represent a pair of conjugate foci where $OA_1 > OB_1$. Then the distance between the foci is $OA_1 + OB_1 \pm t$. If now A_1 move towards O, B_1 will recede from it but it is obvious from the figure that the sum $OA_1 + OB_1$, gradually decreases until the symmetric position A_2B_2 is reached. After which it increases. In this case the two foci are at equal distances from the principal plane, being in fact at the "negative principal points" or "symmetric points," and the distance between them viz. $4f \pm t$, will be the minimum.

It is not difficult to show that, in general, the minimum distance is $f + f' + 2\sqrt{ff'} \pm t$, which, when $f = f'$, reduces to the expression just found.

(5) A further application of this method to illustrate the principle of the Zeiss Vertex Power Instrument was given by the writer in this journal on April 22, 1921.

II.—*Application to Mirrors and Thin Lenses.*

Assuming, in the case of lenses, that the media on both sides are the same, equation (3) is applicable.

(1) *Given x and x', to determine f and β*

Set the cursor at x and x' on OX and OY respectively, adopting a convenient scale and paying due regard to sign. Find the point of intersection P of the cursor with the line $y=x$. If the scales are the same, this line will be the bisector of the angle XOY. The distance of P from either axis gives f (fig. 2). To determine β, move the cursor parallel to itself until it passes through division 10 on OX Then the intercept on OY is 10β (fig. 3).

(2) *Given x or x' and f, to determine x' or x.*

Set the cursor at P (x,y) and at x on OX or x' on OY, as the case may be, and read off point of intersection, x' or x, of cursor with the other axis (fig. 2).

(3) *Given f and β, to determine x and x'.*

Set cursor at 10 and 10β on OX and OY respectively, move it parallel to itself until it passes through P $(f, f,)$. The intercepts on the axes give x and x'.

(4) *Given the radii r_1 r_2 and μ of a lens, to determine f.*

This is obtained from the equation

$$\frac{1}{f} = (\mu - 1)\left(\frac{1}{r_1} + \frac{1}{r_2}\right) \quad \ldots \quad \ldots \quad \ldots \quad (9)$$

which, for this purpose, may be written,

$$\frac{1}{f} = (\mu - 1)\frac{1}{r} \text{ where } \frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2}$$

$$\text{whence } f = \frac{r}{\mu - 1} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (10)$$

r may be determined from r_1 and r_2 as in (1)

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Wherever You are

and

Whatever Your Needs

the L.O.C. organisation is ready to help you—*really* help you. We believe that if we take care of our customers, our profits will take care of themselves. And we've proved it.

Of course, if you happen to be located in Sydney, or Shanghai, Johannesburg or Jamestown, we can hardly expect you to send along all your Rx orders, as is the practice of our friends in the British Isles. All the same, it would surprise you to know how much Rx work we do handle for opticians in far-off places.

When it comes to your general optical requirements—frames, cases, trial lenses, parts, sundries—you'll certainly find it worth your while to make our acquaintance, wherever you are. Why not let us have an idea of your needs and learn what we can do for you ?

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rueide la Pepiniere, Paris. France.

Also at —2, Str-Bursei, Bucharest, Roumania.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

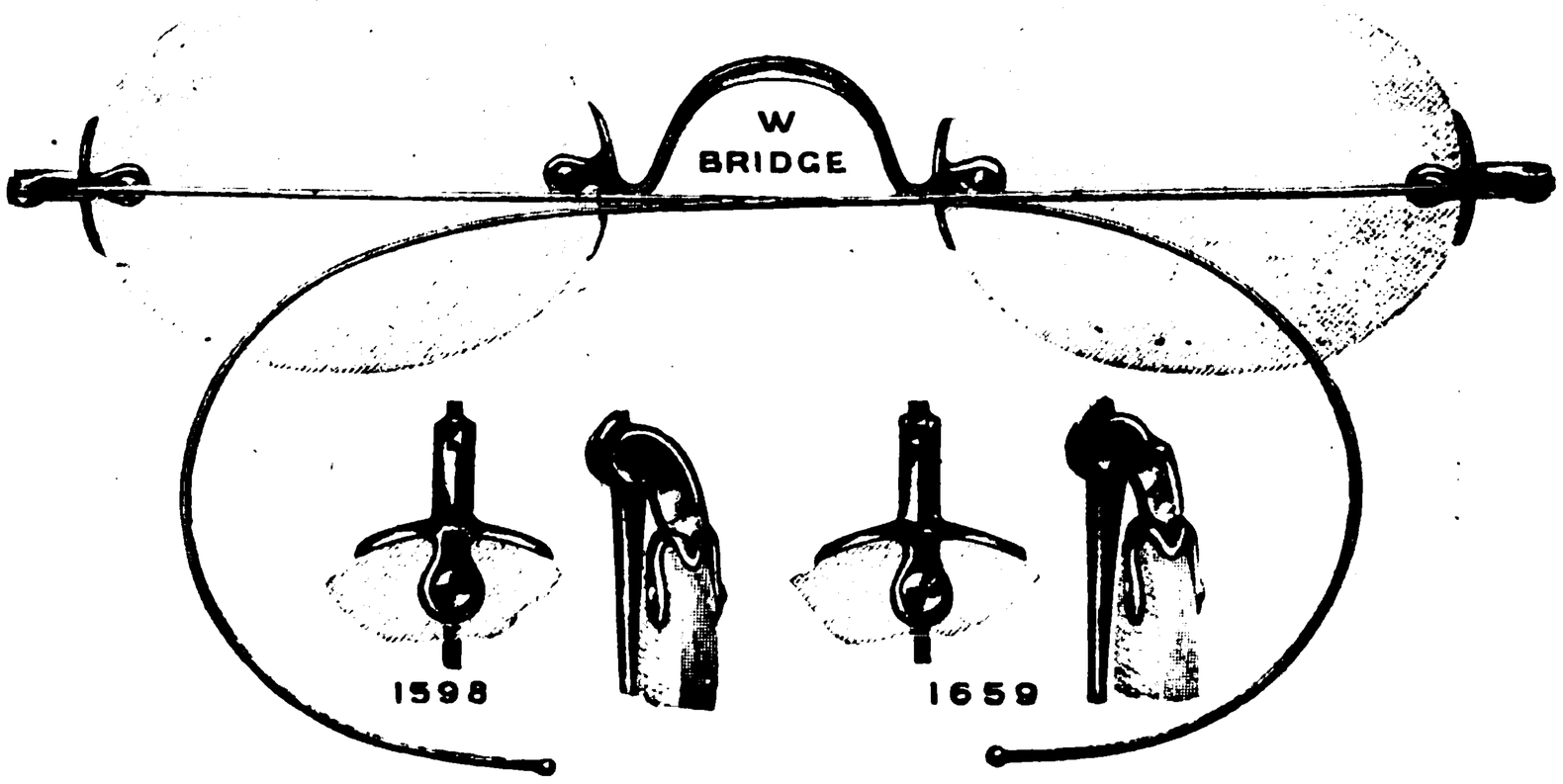
QUALITY FIRST

DUPAUL, YOUNG OPTICAL CO.,

ESTABLISHED 1888.

SOUTHBRIDGE, MASS., U.S.A.

Manufacture only Guaranteed Quality and Best Finish Gold-Filled and White Metal Spectacles, Eyeglass Frames, Astigs, Mountings and Materials.



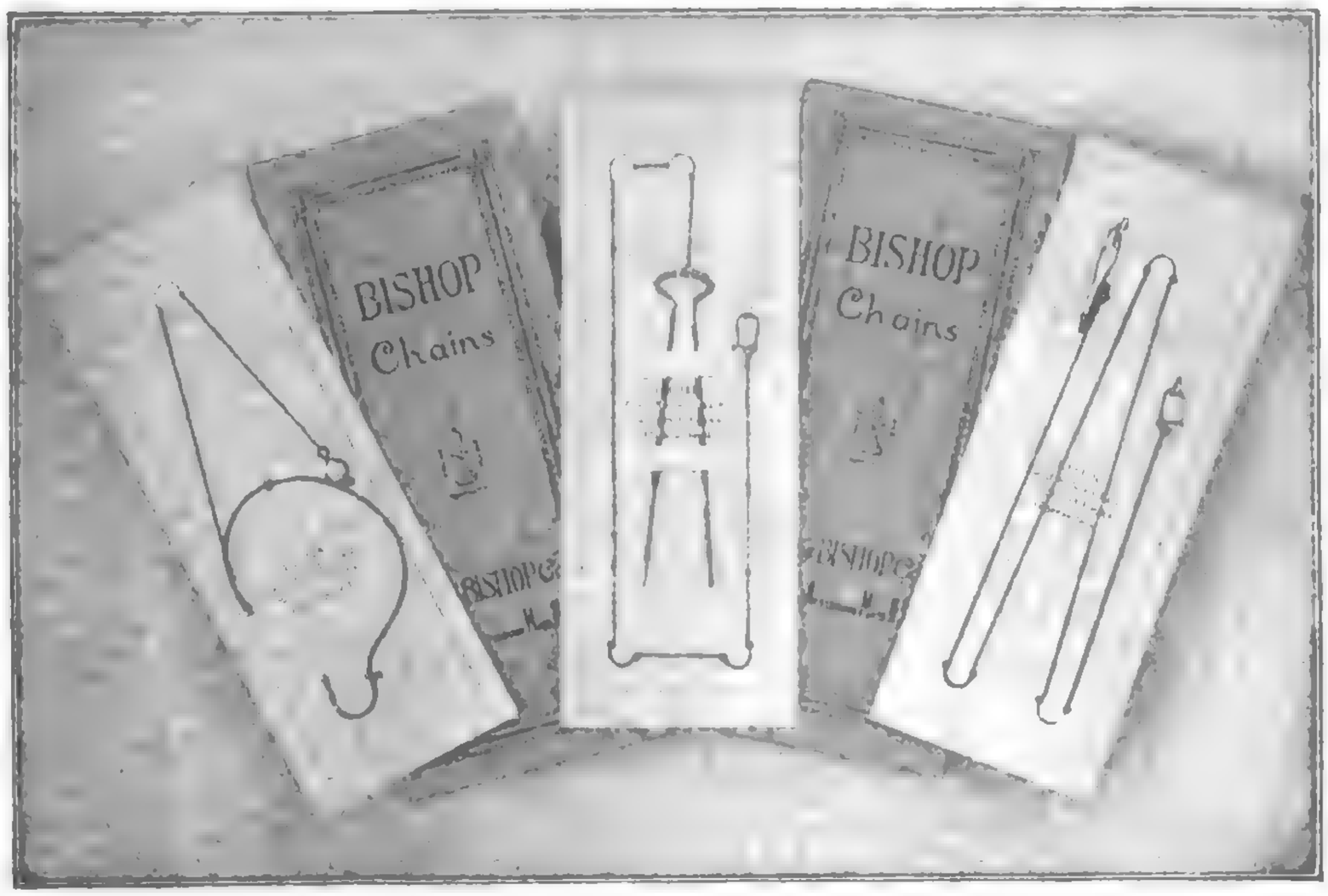
To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: **S. PULZER,** 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. Telephone: CENTRAL 7241

Digitized by Google

Original from THE OHIO STATE UNIVERSITY



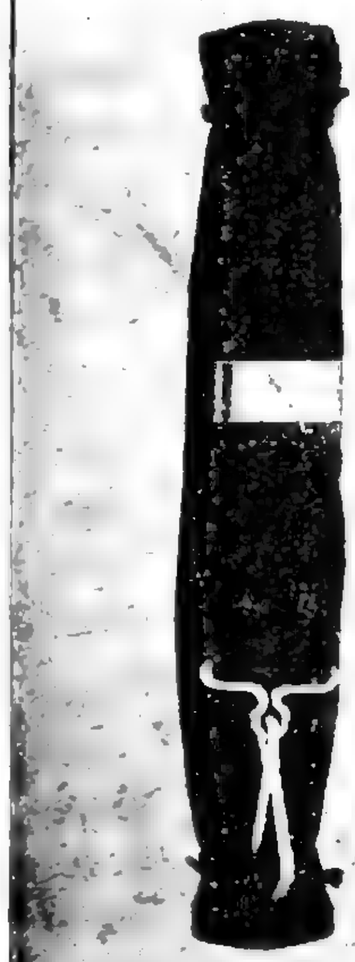
BISHOP CHAINS

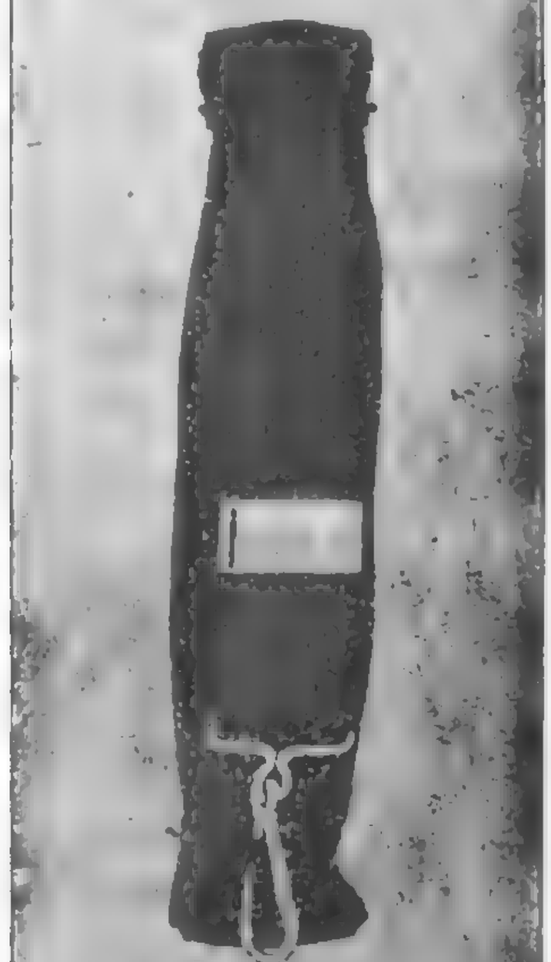
should be your standard of Quality,
in solid Gold and Gold Filled,

BISHOP SILK EYEGLASS CORDS AND MONOCLE RIBBONS.

With Gold Filled, Silver or Gun Metal snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.


14-L


16-L

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

OPTICAL MANUFACTURERS LTD.,

(Incorporating Wheway Optical Co., Ltd.)

WAR TIME CONTRACTORS TO THE ARMY SPECTACLE DEPOT.

Manufacture for the Wholesale Trade:—

Gold and Gold Filled Spectacle and Astig Frames.

Gold and Gold Filled Rimless Spectacle and Finger Piece Mountings.

Gold and Gold Filled Monocles and Reading Glasses.

Solid Nickel Spectacle and Astig Frames.

Solid Nickel Pillar Frames and Folding Gauze Spectacles.

Steel Spectacle Frames.

Spectacle Sides and Jobbing Materials, in all Metals.

Extract from a letter just received by a large Wholesale House:

"We have sold Wheways spectacles for a long time now, and as they have given us such all round satisfaction we have every confidence in them and desire to stock all their products where possible."

All these Articles are of English Manufacture

Works at VYSE STREET and GEM BUILDINGS, HOCKLEY HILL, BIRMINGHAM.

London Office: 55, HATTON GARDEN, E.C.1.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

above and f is then found by dividing by $\mu - 1$.

If $\mu = 1.5$, $f = 2r$, while if μ is nearly 1.5 as in ophthalmic lenses, f is approximately $2r$.

III.—*Determination of the Equivalent Focal Length of two or more thin Lenses in contact.*

The formula for the equivalent focal length is

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} + \frac{1}{f_3} + - - = \Sigma \frac{1}{f_n} \quad \ldots \quad \ldots \quad (11)$$

Starting with the first two lenses find their equivalent focal length, as in II. (1) and (4), by setting cursor at f_1 and f_2 on the two axes, and finding its point of intersection with OP. Combine this focal length with f_3 and so on until all the lenses have been dealt with. The final value found is the equivalent focal length of the combination.

A better method, however, is given in the next paragraph which leads up to the general case of

IV.—*Determination of the Cardinal Points of Two Separated Co-axial Lenses.*

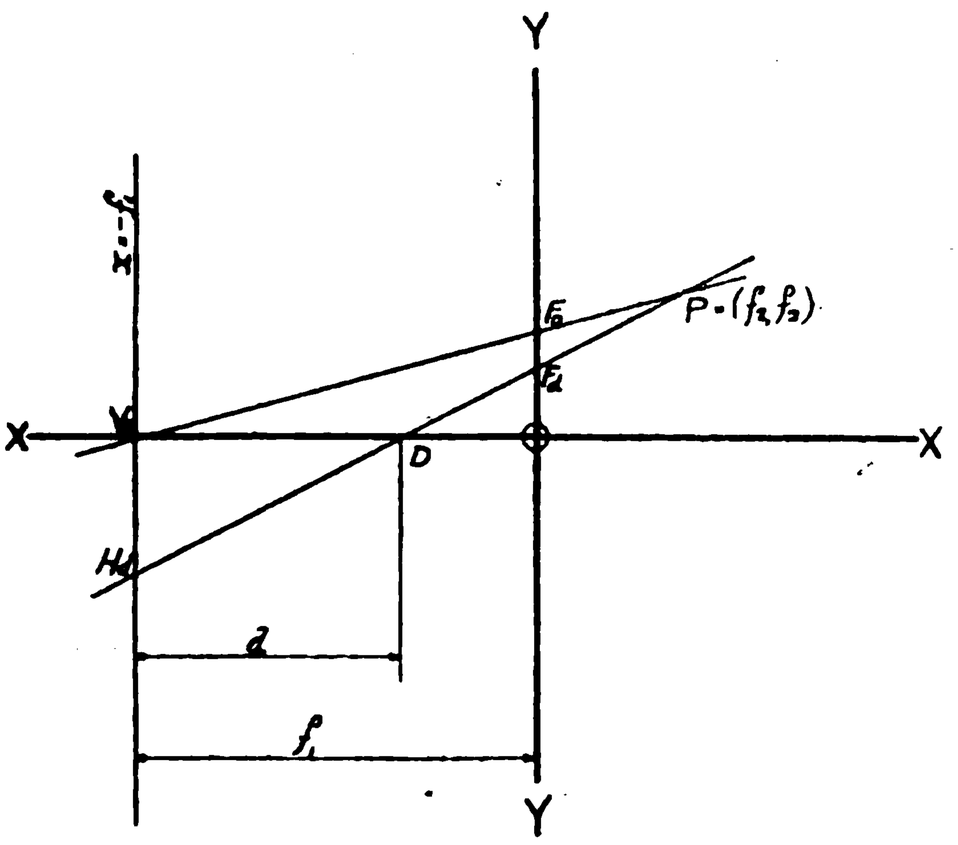


FIG. 6.

The formulæ for calculating the equivalent focal length f, the (back) vertex focal length f_v and the distances h_1, h_2, of the principal points from the vertices are:—

$$f = \frac{f_1 f_2}{f_1 + f_2 - d}, \quad f_v = \frac{f_2 (f_1 - d)}{f_1 + f_2 - d}$$

$$h_1 = -\frac{f_1 d}{f_1 + f_2 - d}, \quad h_2 = -\frac{f_2 d}{f_1 + f_2 - d} \quad \ldots \quad (12)$$

where f_1, f_2 are the focal lengths of the components and d is the distance between them. The subscripts indicate the order in which the light traverses the lenses or surfaces.

Starting, as before, with the two lenses in contact, if parallel light falls on the first lens its focus after refraction will be at a distance f_1 from it and the same distance, therefore, from the second lens. This, considered as object-distance with respect to the second lens will be $-f_1$. Hence to find the focal length of the combination we set the cursor at P (f_2, f_2) and at V_2 on the OX, where $OV_2 = -f_1$ (fig. 6). The intercept OF_0 on OY will give

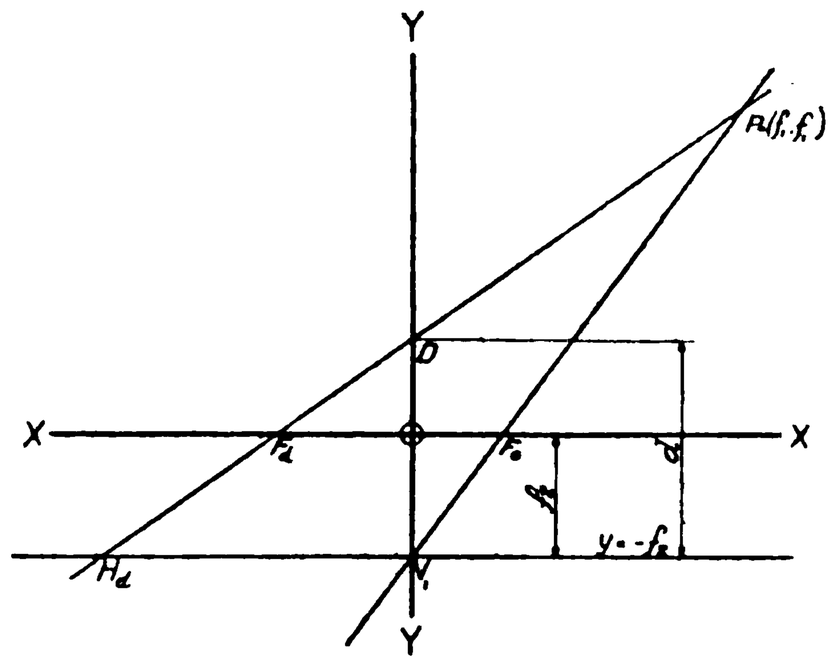


FIG. 7.

the focal length required. If now the lenses are separated by a distance d, the object-distance with respect to the second lens after refraction by the first becomes $-(f_1 - d)$. We therefore turn the cursor about P until it passes through D where $OD = -(f_1 - d)$ or $V_2D = d$. The intercept OF_d on OY will then give the back vertex focal length f_v, and the intercept $V_2 H_d$ on the line $x = -f_1$ will give the distance h_2 of the second principal point from back vertex. The sum of these $H_d V_2 + O F_d$ is the equivalent focal length f of the combination.

This construction is easily proved, for, by similar triangles, we have

$$\frac{V_2 H_d}{V_2 D} = \frac{O F_d}{O D}$$

$$\therefore V_2 H_d = \frac{V_2 D . O F_d}{O D} = \frac{d f_v}{-(f_1 - d)}$$

$$= \frac{d . f_2 (f_1 - d)}{-(f_1 - d)(f_1 + f_2 - d)} \text{ from } \quad (12)$$

$$\text{Hence } V_2 H_d = -\frac{d f_2}{(f_1 + f_2 - d)} = h_2 \text{ by } \quad (12)$$

The positions of the first principal focus and the first principal point may be determined by the consideration that for light to emerge parallel from the second lens it must before refraction have passed through a focus at a distance f_2 from the first lens, if the two are in contact or, at a distance $(f_2 - d)$, if the lenses are separated by a distance d. Hence

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

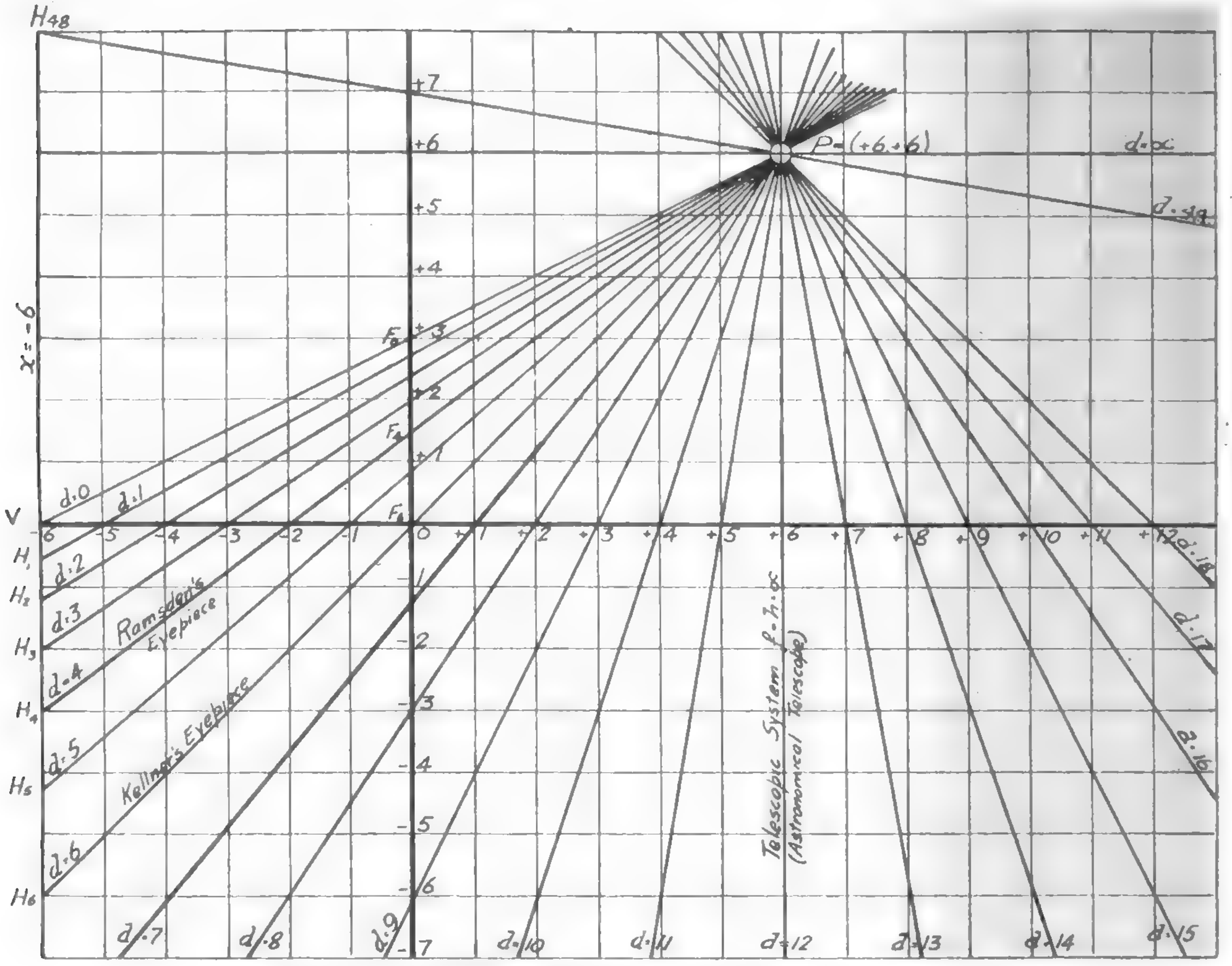
$-f_2$ or $-(f_2-d)$ will be the image-distances with respect to the first lens, and the corresponding object-distances, which will determine the first principal focus, will be obtained by setting the cursor at P (f_1, f_1), and V_1 or D or OY, where $OV_1=-f_2$ and $OD=-(f_2-d)$ (fig. 7).

Then the intercept OF_0 on OX will give the equivalent focal length if the lenses are in contact, while OF_d will give the front vertex focal length, for a distance of separation d, and V_1H_d on the line $y=-f_2$, will give the distance of the first principal point from the front vertex. As before, the sum $H_dV_1+OF_d$ is the equivalent focal length of the combination.

Instead of proceeding in this way to obtain the first principal focus and point it is, perhaps, better to trace parallel, incident rays through the system in the opposite direction and to employ the construction first given in both cases. All readings are then taken on OY and parallel lines. By turning the cursor about P we can trace continuously the changes in the positions of the cardinal points as the interval between the lenses is gradually increased.

We give below several examples of well-known combinations. In all cases the figures refer to points appertaining to the back lens of the system.

(1) Fig. 8 shows the nomogram for a *Pair of Equal Positive Lenses* for which $f_1=f_2=+6$. It is a family of straight lines passing through the pole P $(+6, +6)$ and points -6, -5, -4, etc., on OX corresponding to distances of separation $d=0$, 1, 2, etc. The positions of the cardinal points are also shown by an ordinary Cartesian graph in fig. 9, which may be readily drawn from fig. 8.



Pair of Positive Lenses. $f_1=f_2=+6$. Fig. 8.

(2) Fig. 8 shows the nomogram for a *Pair of Equal Positive Lenses* for which $f_1=f_2=+6$. It is a family of straight lines passing through the pole P $(+6, +6)$ and points -6, -5, -4, etc., on OX corresponding to distances of

Special cases occur, and are indicated in fig. 8, when $d=4$, 6 and 12 respectively. In the latter case the distance apart is the sum of the focal lengths and we have a telescopic system in which the principal foci and points are at infinity. Up to this value of d, f is positive. Beyond $d=12$, f is negative while f_v is positive, which relation holds when the

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



CHEMICO CLEERVIEW

EVERY SPECTACLE USER NEEDS IT ——

is the invention of a Spectacle user who realized that sight might be considerably improved by the

SCIENTIFIC CLEANSING

and polishing of the lenses of

SPECTACLES. EYEGLASSES, Etc.

IT RETAILS AT ONE SHILLING.

Polishing the lenses by the usual method with the pocket handkerchief does not give that clear view and power of which the glasses are capable.

EVERY OPTICIAN SHOULD STOCK IT ——

In the atmosphere in which we live (both indoors and outdoors) are greasy, tarry products which deposit themselves on the glasses and **"BLUR"** the sight.

SAMPLE SENT FREE ON REQUEST

These products are not soluble in water and are not removed by the handkerchief.

BIG BUSINESS IS BEING DONE ——

CHEMICO CLEERVIEW

is a perfect cleanser and polisher and has also the peculiar property of preventing fogging and steaming.

BUT BIGGER BUSINESS IS COMING—

WRITE FOR LITERATURE AND TRADE TERMS.

THE COUNTY CHEMICAL Co., Ltd., Chemico Works, Birmingham.

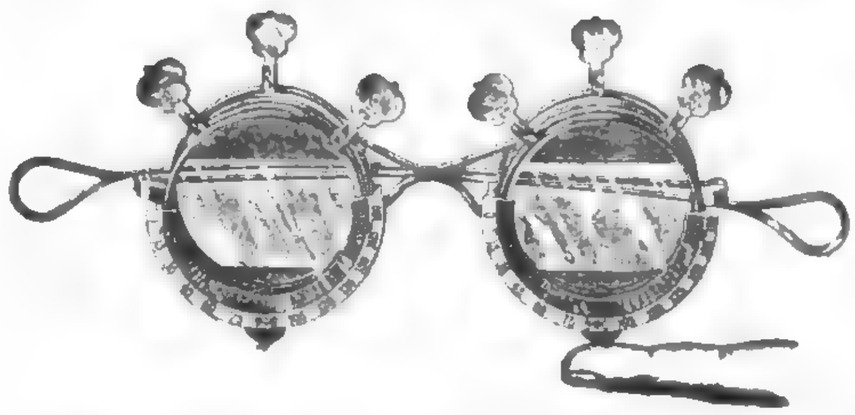
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The GOLDEN RULE for REFRACTIONISTS,
Put your Patients at their Ease.

THE "MOSWHEEL" (RIGID) TRIAL FRAME
WILL DO IT. JUST LIKE AN ORDINARY SPECTACLE.

SIMPLE IN CONSTRUCTION.
SIMPLE IN MANIPULATION.
LIGHT IN WEIGHT.
(Weighs but half-an-ounce.)

Cylinder is rotated simply by the application of the Finger to the Wheel.



The Improved 'Moswheel'

Friction Wheel Trial Frame (Pat. 24314)
RIGID STYLE.

Sizes—51, 54, 57, 60, 63 and 66 m/m P.D.
Supplied in Sets of Three in a Case (case gratis), or Singly in neat box.

THE IDEAL TRIAL FRAME for both Objective and Subjective Eye Examinations.

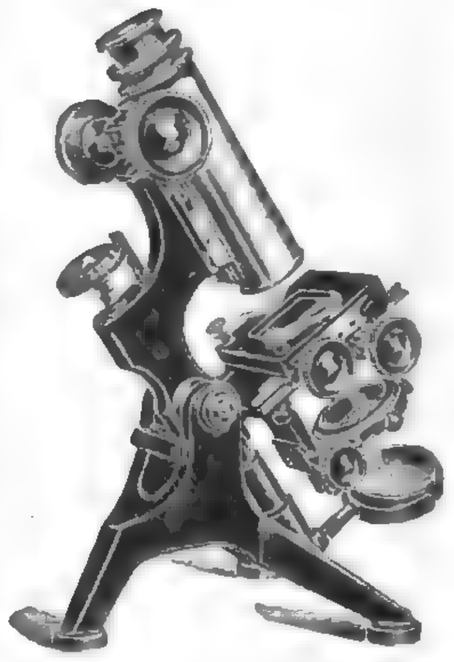
SERVES FOR ALL BUT EXTREME FACES and ensures comfort not obtainable with the average adjustable frame.
(THE MOSWHEEL IS ALSO SUPPLIED IN ADJUSTABLE FORM.)

Obtainable through the principal Wholesale Optical Houses, or direct from the Inventor and Patentee—

ARNOLD MOSELEY, F.I.O.,
190, BROCKLEY ROAD, LONDON, S.E.4

SELL WATSONS'
BRITISH-MADE
MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,
313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1937.

LAUBSCHER BROS. & CO., LTD.,
TAUFFELEN, SWITZERLAND.
Est. 1846.

Makers of Precision Screws and turned parts of all kinds in any metal, for Optical and Scientific Instruments.

We specialize in: G.F. and Nickel Glass Screws, G.F. and Nickel Fingerclip-Spiral Screws, Washers, Rivets, Endpiece Screws, etc.

For particulars and prices write to Representative:

E. F. LIECHTI,
73, Englewood Road, Clapham Common,
LONDON, S.W.12
Telephone: STREATHAM 2382.

THE
GLASSIE
LENS CLEANER

The "Glassie" Lens Cleaner is a neat advertiser for opticians.

It does its work THOROUGHLY:

A. **It polishes.**
B. **It advertises.**

Many opticians say it brings more business than their name blazoned in gold on a case does.

All progressive Houses have "Glassies."

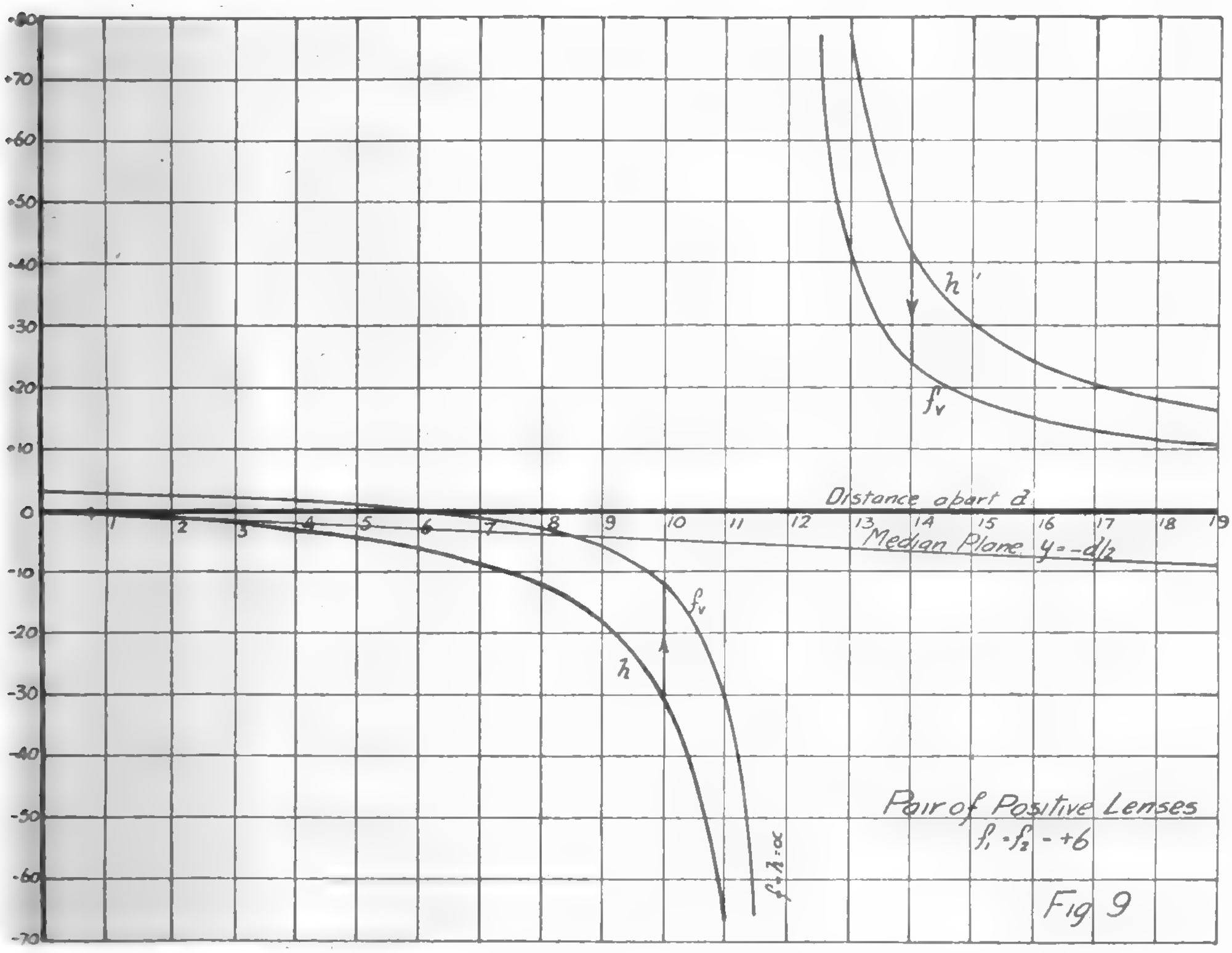
Samples and Prices from your Jobber or direct from

THE GLASSIE LENS CLEANER Co
156 CHARING CROSS ROAD, LONDON, W.C.2.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

eyepiece is pulled out beyond the ordinary adjustment for parallel rays. We have here the, at first sight, curious property of a system possessing a negative focal length and yet forming a real image. The writer employed a telescope in this manner to form an image of the sun on a screen during the last eclipse. Further, between $d=0$ and $d=6$ the principal planes are crossed and between the lenses, between $d=6$ and $d=12$ they are crossed but outside the lenses. While beyond $d=12$, they are outside the lenses but no longer crossed. This crossing of the principal planes is shown in fig 9* by the fact that the first branch of the curve for h lies below the line indicating what we have termed the median plane.



* I believe that curves similar to this were published some years ago by Dr. C. V. Drysdale, but I have not been able to refer to them.

[To be continued.]

German Subsidy for Scintific Publications

An interesting example of the use of the German "Productive Unemployment Relief" Funds for assisting private industry is that of printing, cited in the 'Board of Trade Journal.' It appears that a subsidy out of the Fund is to be given to firms who engage unemployed workers for printing scientific works and magazines. The grant is to amount to 24 marks a day for each unemployed person set to work and thus withdrawn from dependence on the unemployment donation. But this sum is, moreover, to be paid not only in respect of newly engaged, hitherto unemployed workers; it will also be paid in respect of half the days worked by the permanent workers. A total sum of 2 million marks is ear-marked for use in the printing trade under this scheme. The list of scientific works and magazines to be printed under this scheme is drawn up by a Union of Scientists and furnished to the Joint Board for supervising the National Collective Agreement in the Printing Trades, and a technical committee is to meet shortly to conclude printing contracts.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

German Export Success is Exaggerated.

Since the reparations settlement was effected in May there has been a deal of superficial discussion to the effect that German workmen are working long hours at very low pay, and that some 60,000,000 people in Germany are buckling down to capture the world markets, crush foreign competition and pay off their indemnities with manufactured products, enjoying all the while the advantage of greatly depreciated currency, low cost of living and of materials as compared with other manufacturing nations.

On the contrary, states L. R. Morris, research editor of the 'American Exporter,' Germany, instead of being in a better position to compete with the United States than before the war, is in a much worse position. This fact is a subject of comment of the German trade press and is emphasised in both official documents relating to German export trade and the reports of prominent banking houses, as witness this statement, in 'Der Welthandel,' which indicates the general attitude in Germany towards the export situation: "We dare not remain in ignorance of the fact that in practice the rebuilding of German export trade presents greater difficulties than would appear at first glance. Wherever the Hanseatic export merchants turn they meet the powerful competition of the United States. In Asia, in Africa, in South and Central America, the competition of American, Japanese and English wares has entrenched itself through supplying high-grade articles in certain lines, and also through favourable deliveries and terms of payment."

An official report from the German Consul in Malmö, Sweden, states that although directly after the war there was a great increase in Germany's exports to that country, the prices of goods ordered were frequently arbitrarily raised to twice the original amount, thereby causing great indignation. The same report states that it is common knowledge that firms which formerly favoured German goods now refuse to buy them in order to avoid such inconveniences. Complaint is specially severe with regard to the method of payment exacted by German manufacturers—namely, the payment of one-half in cash upon placing the order and of the second half upon completion of the goods. Swedish importers have found that if the quality of goods as delivered were not up to the sample they had no recourse but to accept delivery, and since payment must be made in Germany they would have to institute legal proceedings in that country, which is a difficult matter. The German Consul at Malmö advises that the method of payment be altered to the so-called "English" system—namely, payment of one-third upon placing an order, of another third upon receipt of the documents, and of the last instalment 30 days after receipt of goods. He likewise points out that the quality of German goods imported in Sweden compares very unfavourably with pre-war products, and that the only means whereby German manufacturers can hope to secure a large share of trade is to build up a reputation for quality, rather than for the production of cheap goods as heretofore.

A recently published statement of the Disconto-Gesellschaft of Berlin, one of the most important German banks, makes the following comment on Germany's export trade: "Difficulties which stand in the way of exports are great. The further expansion of exports will have to be made up, not so much by increased quantities exported, as by an enhanced value of the goods shipped. The pressure brought to bear on our economic life necessitates our whole economic structure being put on a different basis in order to obtain better results, and this will no doubt tend to influence exports."

A letter from a German firm in Hankow, China, published in a German export paper, bewails the stagnation in German export trade with China, and points out that import merchants there are unable to buy German goods at a good price unless their capital is large. It is said that only by low prices will it be possible for Germany to compete with the efforts of Japanese exporters, who can now supply Chinese merchants with their requirements at a firm price on a few weeks' notice, and at a rate comparable with the German. "It would seem," this house states, "that the German at home is particularly anxious that German goods shall not be put on the Chinese market at too low a price."

The chief characteristic of German goods has always been cheapness. This continues to be the case, and German trade papers and consular officials are complaining that Germany's habit in this regard is seriously hampering her export trade. With the increase of wealth and culture all over the world, as the 'American Exporter' points out, the de-

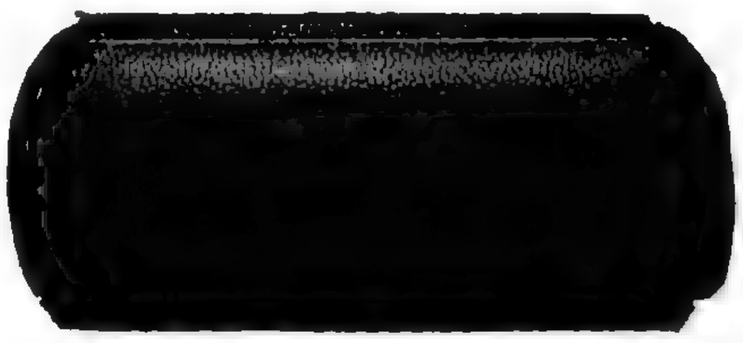
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

"WERTEX"

WILLMOTTS'

LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.





"WERTEX" Cases are Supplied in 4 Sizes 3 Grains 3 Colours.





Particulars from Your Dealer or direct from the Manufacturers.

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

ENGLAND.

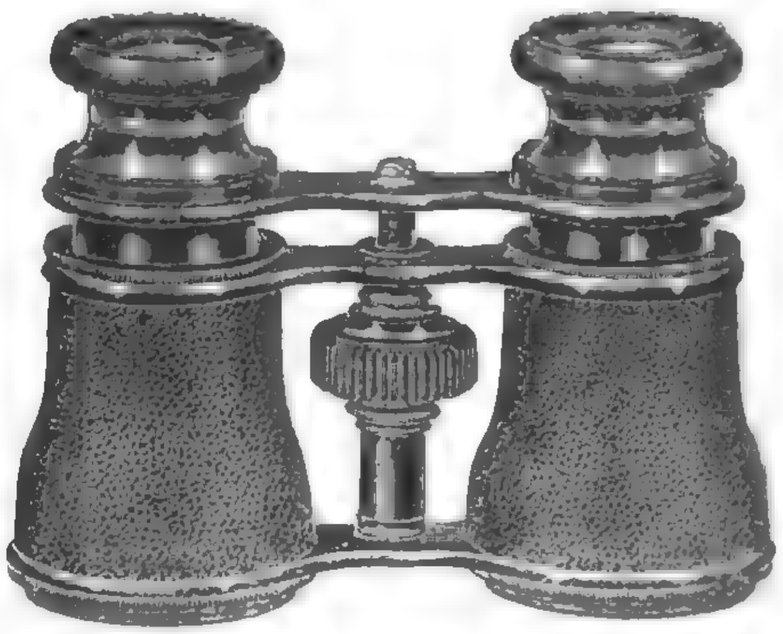
D

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

BUY FROM BAROUX & BION, Ltd.,

2, TOWER ROYAL, LONDON, E.C.4



PRISM. OPERA.

For Theatre 3× Magni'tion
„ Sport 5× „
15 mm Object Glass.

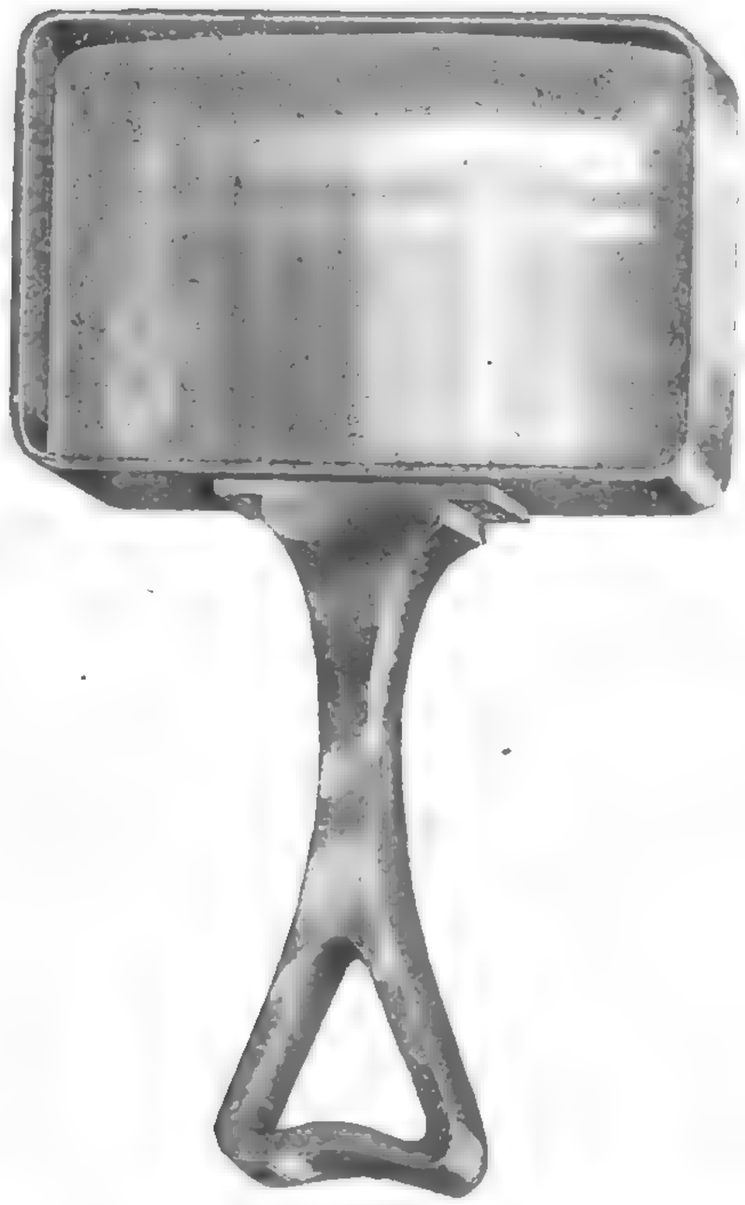


A few of our well-known MODELS.

'DUCHESS' MODEL.

Aluminium, all sizes Polished or Japanned, Bodies covered Morocco.





BUFFALO-HORN READERS.

Round and Rectangular.

ALUMINIUM READERS.

All sizes in Stock.
Round and Rectangular.

Wholesale and Export.



"MARQUIS" MODEL.

Aluminium. All sizes.
Polished or Japanned Bodies covered Morocco.

TELEGRAMS: BIOTICS, LONDON.
CABLE
TELEPHONE: CITY 59.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

mand for quality goods, rather than cheap goods meretriciously dressed up, is bound to increase. This would suggest that the export future is with the United States rather than with Germany.

There is one advantage which German manufacturers have with regard to labour costs, it is emphasised, and that is that the German government, by restricting prices on foods and certain other articles, and subsidising food distribution to a certain extent, and by maintaining railway transportation at a loss, is artificially restricting the rise on the cost of living and the cost of transportation which would take place if economic laws were allowed to have their way. Eventually the German people, including the manufacturers, must pay for these subsidies by way of taxation and by further depreciation in the purchasing power of their currency, and in the long run the manufacturer himself will have to pay probably more than his share of the penalty for these violations of economic law.

As indicative of present German industrial conditions it is significant that the quantity of goods loaded on shipboard in Düsseldorf harbour in June was only one-half that loaded in February, and railway car-loads loaded were one-third those in February. In Düsseldorf, in June, 200,000 out of 550,000 workmen were working on part time. In 90 concerns in that city employing 50,000 men the number of hours less than normal worked by the employees had increased since March 450 per cent. In the Rhineland some concerns had, in June, decreased their production from 30 to 50 per cent. In the city of Zwickau, Saxony, 33⅓ per cent. of the entire population were unemployed. Although no German export statistics have been issued for 1921, the import statistics of the other countries, so far as available, show anything but a preponderance of German trade.

Messrs. Fleming's New Specialities.

Messrs. J. & R. Fleming, Ltd., of Clerkenwell Road, London, are placing on the market a new series of reading glasses manufactured by the London Tortoiseshell Co., Ltd., from their new "Lotoshell" non-inflammable material. They are practically indistinguishable from genuine tortoiseshell and, being sold at a moderate price. There should be a ready demand at this season of the year.

Messrs. Fleming also inform us that deliveries have now commenced of their new toric demonstrator.

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

British Manufacturers' Prices.

Sir,—We note the letter in last week's *Optician* from "Lancastrian" regarding "British Manufacturing Prices," and shall feel obliged if you will allow us to point out to your readers that we have no intention of raising our prices through the passing of the Key Industries Bill; neither have we heard of any other firm of repute taking such action. Such ill-advised policy would defeat the objects of the Act. The nature of the rumour which has reached "Lancastrian" points to the quarter from which it originated.

C. Baker.

244, High Holborn, W.C.1.

Sir,—I have read with interest the letter in your issue of October 21st, signed "Lancastrian."

Your correspondent appears to be particularly unfortunate in his conclusions. May I, as an interested person in two sections of the industry, ask him for some evidence of his assertion that lenses may be increased in price.

In the third paragraph of his letter he speaks of there being no justification for the increase. Surely, your correspondent, to make such statements must have a knowledge of the industry, and therefore it must be known to him that the English manufacturers have had a very severe task to establish this industry, and owing to lack of support quite a number of them have had to give up manufacturing. This necessarily means that quite a large percentage of the lenses used in the country have still to be imported, and are subject to the 33⅓ per cent. tax.

In the last paragraph he speaks about "the ring." I can only assume that some such group of persons is responsible for the increase which he maintains is coming. Can he give me some information as to who they are, as the writer, who has a fair knowledge of the industry, has at present no knowledge of such a ring.

D2

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Let me assure your correspondent that the English manufacturers are only too anxious to develop the lens industry in this country and employ British labour, and if our friends the retailers, will give them support, I am perfectly certain that they will have no cause to complain of prices rising. Had this industry been well established before 1914, it would have been to the benefit of the whole industry.

In conclusion, I take it that your correspondent is a member of the N.A.O. I should like to ask him his reason for joining that Association.

C. B. USTONSON.

Taylor and Ustonson, Ltd.,
19-20, Red Lion Street, Clerkenwell, E.C.1.

Early Sight Testing.

Sir,—Re "Early Sight-Testing," I well recollect "over 30 years ago" in my apprenticeship, that Mons. Fournet, Mr. Gray-Keith, and Mr. Henry Laurence were the examples quoted then as having sight-testing rooms, and to the latter was attributed the first separate sight-testing room as a contrast to the "Old Curiosity Shop." Mr. T. Henri and Dr. Ackland I never heard of until coming to London 25 years ago, while the other three were, figuratively speaking, household names in optician's shops in the provinces then. Mr. Gray-Keith and Mr. T. Henri, who I believe are still with us, were then in their prime, and should have no difficulty in giving us dates with reference to the same.

S. TWITCHER.

Redland, Bristol.

Sir,—Without any desire to enter into any controversy with your numerous correspondents, I give the following further particulars regarding the inauguration of "sight-testing" amplifying my letter above "Fairplay."

I must amend my previous statement however, regarding Mr. T. Henri, and say he was *one* of the pioneers, etc. In 1881, the firms in business included Mr. J. Bateman in the Strand, also Stewart, Gregory and Horne and Thornthwaite; Negretti and Zambra in Regent Street, and Laurence in the Poultry. Mr. T. Henri was with Mr. John Bateman, as also was Mr. Aitchison (an apprentice, I think). When Henri left Bateman in 1882 and opened in Newgate Street, Mr. Aitchison went with him. Astigmatism at that time was almost an unknown quantity among opticians, surgeon oculists alone being able to prescribe for it. That Mr. Henri taught Mr. Aitchison there is no doubt, and that gentleman himself gladly acknowledged it many years ago at a reunion dinner.

In 1881, Browning published the first "Treatise on the Eye" (excluding, of course, medical works), and in 1882, Mr. Henri published his "Treatise on the Eye" and during the next 7 years 6 editions were published. About 1890 or 91, Mr. Henri with Mr. Aitchison started the Optical Society, but it was the latter gentleman who was the mainspring.

I have pleasure in enclosing herewith 3 interesting letters received by Mr. Henri from Mr. Gladstone and Mr. Justin McCarthy.

May I say in conclusion that in criticising Mr. Bloom's advertisement I had no desire or intention to open an argument, and I only write this further letter because I have the honour to be Mr. Henri's son.

If the gentleman whose letter you felt you could not publish would care to communicate with me I shall be pleased to answer him.

T. H. STAUNTON.

103, Neville Road, Forest Gate, E.7.

*** The letters from the late Mr. W. E. Gladstone and the late Mr. Justin McCarthy, which are couched in very appreciative terms, are dated December 22nd, 1887, April 16th, 1892, and May 14th, 1892.

Opticians' Advertising.

Sir,—I have from time to time noticed discussions in your columns, referring to methods used to advertise one's capabilities of sight-testing. Recently I noticed one which might interest your readers. Of course, I suppose the gentleman concerned has a perfect right to advertise in this manner, but from the novel point of view I think it worthy of mention. It runs as follows:—" ———, F.B.O.A., F.S.M.C., F.I.O.O. (By Exams.), and the Freedom of London for my skill in Optics." and attached to the window is the "Freedom."

Was the "Freedom" intended for such a cheap display?

A FREEMAN.

Shur-on Publicity.

The current issue to hand of the "Shur-on Chronicle" is a fine example of a house organ, containing much that is of interest to the retail sight-testing optician. It is issued by the Shur-on Optical Company, Rochester, N.Y., U.S.A., the manufacturers of a number of deservedly popular lines in "Quality" goods.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

DAVIES, COLEMAN & CO., LTD.,



High **C**lass **Q**uality together with real **V**alue is never needed more than to-day.

Dacol Binoculars meet that demand—The Model shown above is typical of such value—

There are many models for various purposes and occasions all having that careful finish both in workmanship and effect.

See List Below.

H.R.H. The Prince of Wales

has purchased a pair of Dacol Binoculars for use on his tour in India.

D2052 × 20 Mag.
D1648 × 16 Mag.
D1245 × 12 Mag.
D1026 × 10 Mag.
D81 × 8 Mag.
D31 × 6 Opera
D615 × 6 Lady's Field.
D31 × 3 Opera (Fancy).

Telephone: HOLBORN 2597.

Telegrams:
United Kingdom:
MARIDUNUM, Fleet, London.

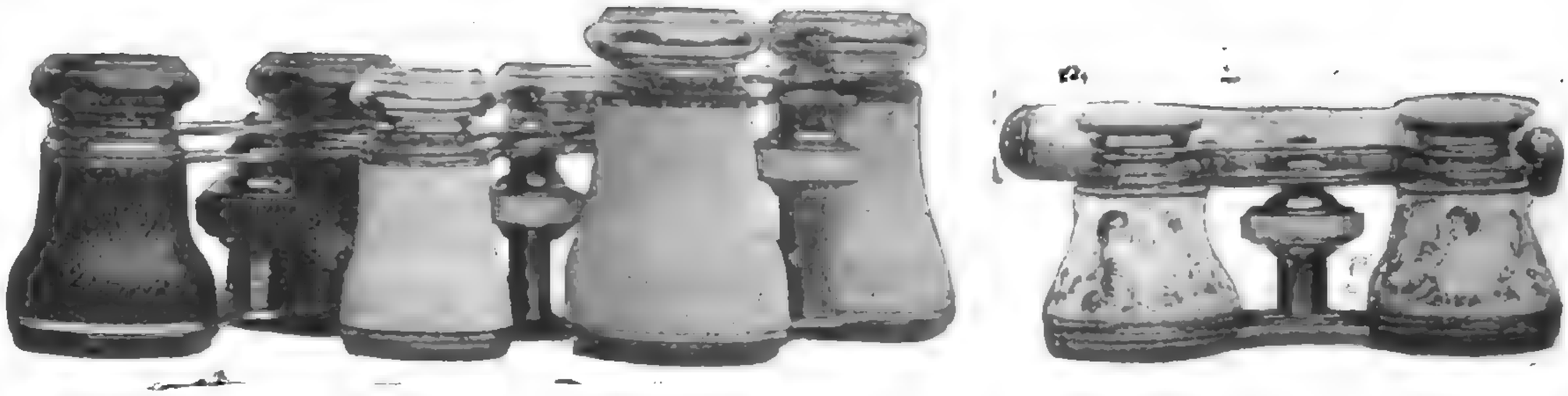
CODES A. B. C. 5th Edition.
Western Union.

45 & 46, FETTER LANE, LONDON, E.C.4

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

SPECIAL NOTICE.



We hold Large Stocks of OPERA GLASSES in ordinary and Handle patterns, with Morocco Covered, Pearl or Enamel Bodies.

As these were bought before the Key Industries Bill became Law and when the Rate of Exchange was greatly in our favour, we can offer our present stock at exceptionally Low Prices.

We also hold large stocks of FIELD GLASSES, TELESCOPES, MICROSCOPES, PRISM BINOCULARS, etc., etc., which are Splendid Value.

Full particulars and prices will be sent on application.

JOHN BAIRD, **"HERALD" OPTICAL WORKS,**
Manufacturing Optician, **68 & 70, MITCHELL ST., GLASGOW.**
Telegrams: "SPECTACLES, GLASGOW." ***Telephone: CENTRAL 541.***

Digitized by Google Original from THE OHIO STATE UNIVERSITY

The British Industries Fair, 1922.

We have recently read a letter issued a short time ago by the General Manager of the Association of British Chemical Manufacturers (Mr. W. M. Woolcock, C.B.E., M.P.), to the members of the Association with regard to the British Industries Fair, and remark that Mr. Woolcock urgently impresses upon the members the desirability of participating in the Fair, both because of their own interests and of the necessity of upholding the prestige of the British chemical industry. It is evident that he is very desirous for manufacturers to realise their responsibility for demonstrating to the public that theirs was not an idle and selfish cry for protection of their industry, and that they are able to give ocular proof of their determination to bend to the task of "delivering the goods."

There are many people, in politics and otherwise, who would require only slender ground for an accusation that protection manufacturers think rather of lining their own pockets than of considering the provision of the machinery and organisation for turning out "key" products; and Mr. Woolcock draws attention to the opportunity afforded by the Fair of giving a display of chemicals, hitherto obtainable only from abroad, now being produced at home. It seems, judging from enquiries we have made, that the industry is making a very warm response to the invitation, for we understand that all the dye firms of importance in the United Kingdom, and well over 50 per cent. of the members of this large Association, have signified their willingness to participate in the Fair.

Fine chemicals used to be the pre-war province of the continental manufacturers, but a good number of leading manufacturers are to deliver a decided blow to the contention that success in this branch of industry is a monopoly of foreign brains and initiative.

It is presumed that the scientific instrument makers, whose products are, in many instances, a very important adjunct to the chemist's armamentarium, will not be slow in imitating the action of the chemical manufacturers should they not have even already decided on a similar course. It occurs only too readily to the mind of the man in the street as well as to that of the already biassed politician, that if the United Kingdom scientific instrument maker cannot supply the demands of the industrial laboratory or the scientific worker, the foreigner must be called in to make good the deficiency; and whilst it may be quite a common place to people in close touch with them that the scientific instrument manufacturers can fill the bill, the fact requires advertisement, and the manufacturer should make it his business to tell the public from behind his new rampart of protection, that now he is in a position to do what is required of him—in both peace and war.

The British Industries Fair seems to be an admirable venue for this purpose: it is an exhibition organised by a Government department, not run for profit, and has had a constant and rapid growth since its inception in 1915, and is patronised annually by Royalty. As an exhibition, it is cheap, for we are informed that for a sum of approximately £18, an exhibitor secures on a floor space of 36 sq. ft., a well-built and attractive stand, fitted with counters, shelving, signs, electric light, etc.; whilst if a number of exhibitors join together, as in the case of the Association of British Chemical Manufacturers, the cost is considerably less; thus for an area of 400 sq. ft., divided among 10 exhibitors, the cost would work out at approximately £15 15s. each. When the cost of modern advertisements is considered, these figures are very small; for included in the benefits extended to exhibitors are entry of the firm's name and list of manufacturers in the Fair catalogue, which is a handy book of reference. Circulation of the catalogue is guaranteed at 40,000 copies; and apart from copies distributed in this country large numbers, we are informed, are sent overseas annually to His Majesty's Trade Commissioners, Imperial Trade Commissioners, Commercial Counsellors, Secretaries and Officers of the Consular Service.

The Fair has, therefore, a wide range of publicity, and should be admirably adapted for focusing public attention on the far-reaching effects of the protective tariffs levied under the Safeguarding of Industries Act, 1921, and incidentially for emphasising to sceptics that the industries concerned are worthy of protection.

Removal.

Messrs. H. C. Ryland & Co., Ltd., (Cameron Works, Manor Park), have acquired new factory premises at East Sheen; and after November 9th, their address will be Optic Works, Lower Richmond Road, East Sheen, S.W.14.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Importance of Standardising British Thermometers

The British Lampblown Scientific Glassware Manufacturers' Association, Ltd., write that an important question at the present time is:—*Is it advisable that every clinical thermometer offered for sale in Great Britain should be tested at the National Physical Laboratory?*

From the consumers' point of view there can be no question as to the vital importance of knowing that a clinical thermometer is accurate within 2/10ths of a degree Fahrenheit. Compare the sales of clinical thermometers with such commodities as butter, beer, etc. You buy a pound of butter and if it is not exactly a pound, or if it is not pure butter, the supplier can be prosecuted and fined. Similarly with beer and spirits—if the supplier gives you a fraction under measure or faulty quality you have the right to report him and he is prosecuted. But if you buy a clinical thermometer upon the accuracy of which depends the accurate diagnosis of an illness and possibly life and death, you have no means of knowing whether it is correct to 2/10ths of a degree or incorrect to the extent of 2 or 3 degrees.

From the makers' point of view it might be urged that they would resent anything which would make towards delay in manufacture and restriction of output, and that they would depend upon the ordinary course of business to obtain orders only on quality or make. The latter may apply where the thermometers bear the maker's name or trade mark, but unfortunately such cases are rare and the bulk of clinicals bears the inscription "Best British Make" or something similar, and in such cases it is difficult or even impossible to trace the maker of a bad instrument. The makers, however take a broader view of the position and consider it is to the good of the trade in this country that there should be such a standard of accuracy of clinical thermometers that everyone will know the British article to be above suspicion.

It may be interesting to recall the origin and working of the Order in Council for the compulsory testing of clinical thermometers which operated from November, 1918, to March, 1921. As with many other articles during the great war, the supplies of clinical thermometers were quite inadequate to the demands. The War Office and Ministry of Munitions placed large contracts with every maker—good, bad or indifferent, and production was greatly and hastily increased regardless of quality. It happened that some members of the Government investigating waste at the front found clinicals being broken and thrown away wholesale, and were informed that these were too inaccurate to use. The Government therefore specified in its contracts that every clinical thermometer should be tested, and the National Physical Laboratory installed plant to cope with the large quantities which would thus be received. The results of the first batches tested were astounding—*at least 25 per cent. were rejected as inaccurate*— one out of every four thermometers was worse than useless as a thermometer. These rejections had the effect of stiffening up the calibration and maker's tests, with the result that in a short time the percentage of rejections fell to 5 per cent., and at the time of the abolition of the compulsory test the rejections were in the order of 1½ per cent.—only one thermometer out of every seventy made. It may be interesting to point out that the quantities under test are:—

November, 1919. Compulsory test of *all* clinical thermometers, 135,000 per month.

March, 1921. Abolition of test on *exported* thermometers, 65,000 per month.

June, 1921. Abolition of compulsory test, 55,000 per month,
of which 4,000 per month are of German manufacture.

Wisdom of a Compulsory Test.

One would think that such an improvement and such excellent results would prove the beneficial effect of a compulsory test, but when the Clinical Thermometer Bill was placed before Parliament in July, 1921, to replace the lapsed Order in Council, objections were raised by six members, and the Government had no option but to defer the Bill until next session, whereas had there been no opposition the Bill would have been law at the end of August.

Great Britain was the first to see the wisdom of this compulsory test—France immediately followed suit (May, 1919), Japan (January, 1921), and Germany (August, 1921). America has compulsory tests in various States and may have national legislation in the future.

It is almost ironical to observe that just when other nations have followed our lead in this matter—at such time Great Britain, on account of a purely political move, has abandoned the principle, of which it was the instigator, and is thus open to receive from any part of the world, thermometers *which are probably not sufficiently accurate to pass an independent test.*

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

T. A. R. & Co.

"THE ALL BRITISH HOUSE."

Over 2,000 Designs in Aneroid Barometers.



Time and Tide
And Ship's Instruments



T. A. REYNOLDS & CO
40-1-2 PERCIVAL STREET,
LONDON E.C.1



Steam-pipe Thermometer *Hydrometer*

Telegrams—
"THERBAROME. LGNDON."

Telephone—
339 CITY.

Showrooms and Offices at above address.

If you are a Retailer and need ORIGINAL LINES in Barometers, Clocks and Thermometers, write us, and although we will not supply you direct, we will put you in touch with the Nearest Wholesale House.

WHOLESALE AND SHIPPING TRADE ONLY.

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY



Finger Piece Supremacy

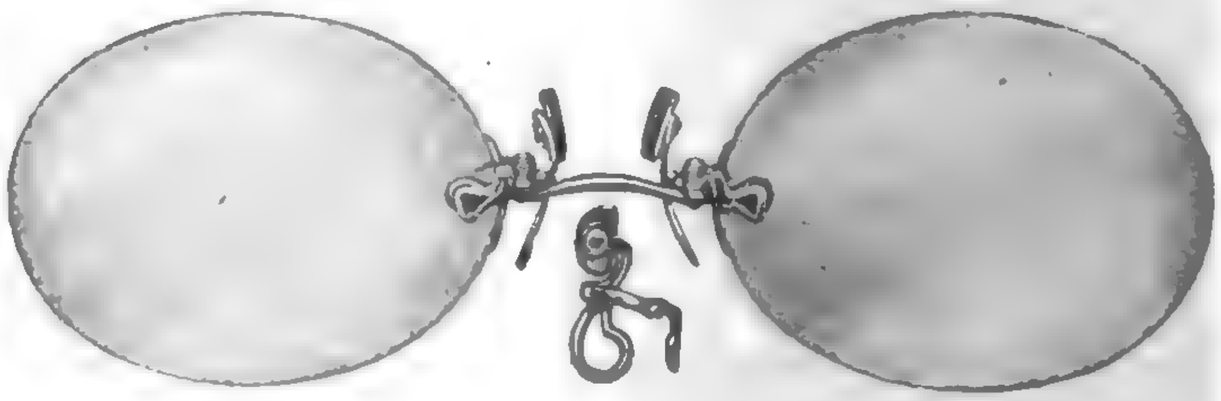
Finger piece Mountings and Frames have always been our specialty. Our original Finger piece line, which we named **Realfit,** became so popular with the optical trade that we recently adopted the name **Realfit** for all our products.

No finger piece mounting on the market gives longer wear or greater satisfaction.

Made in 1/10-12 ct gold filled also 10 and 14 ct. solid gold. The mounting is constructed with jeweler's precision to afford the utmost comfort, beauty and durability.

Made in all standard sizes with a complete assortment of guards. Your wholesaler can supply you with **Realfit Products.**

REALFIT ***Finger Piece.***



NEW JERSEY OPTICAL Co.,
Newark, N.J., U.S.A.

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

British Columbia Optometry Act.

The British Columbia Optical Society have been successful in procuring an Optometry Law after a long hard fight. When the Bill was presented to the Legislature last year, writes Mr. L. Morris, in the 'Canadian Optometrist,' the Legislators, at that time, seemed to know little about optometry, or just what the optometrists were asking for, and the Bill was held over until the next session: in the meantime the oculists got very busy, doing all in their power to influence Members of the House to oppose the measure. The Legislative Committee of the Optical Society undertook an educational campaign showing the Members of the Legislature the necessity for an Optometry Law—this they did by printed literature, circular and personal letters and conversations with the representatives. The result was that when the Bill was presented this year a large majority of the Legislature were in favour of the Act.

A committee of the House was appointed to consider the proposed legislation before whom three optometrists and three oculists appeared. each side to present their claims. The optometrist side was represented by Messrs. A. P. Blyth and F. W. Nolte, of Victoria, and Mr. L. Morris, of Vancouver. They impressed the committee very favourably with their concise and well thought out arguments in favour of the Measure. Drs. Campbell, Boucher, and Esling addressed the committee claiming that the proposed Act was not in the public interest and classed all the optometrists as ignorant fakirs, vehemently remarking that they did not distinguish between the incompetent spectacle pedlar and the optometrists present—they were all fakirs in the same class.

The result was that the committee reported favourably on the Act to the House, recommending, however, several changes to which the sponsor for the Measure and Counsel for the optometrists agreed. (1) One medical doctor will be on the Board of Examiners; (2) The exclusion of oriental or other foreign citizens from practising; (3) The regulations to be made by the Board of Examiners to be a part of the law and a descriptive bill of purchase to be given each customer. These are the principal changes. The Law came in force on the 1st of July, 1921.

Much credit is due Capt. Ian McKenzie, M. L.A., Sponsor for the Bill, and Mr. J. S. Cowper, Counsel for the Optometrists, whose persistent work and influence was so effective. The Bill passed without a dissenting voice. The British Columbia optometrists rejoice and many expressions of thanks have been received by the committee for their untiring efforts and good management. The committee were Messrs. A. P. Blyth, J. H. Le Page, F. W. Nolte and W. N. Rowlands, of Victoria, and Messrs. Geo. T. Gilpin, A. G. Hirschberg, H. A. Liphardt, W. Lawrence Smith and Leonard Morris, of Vancouver. The Board of Examiners will be appointed in a short time and their regulations published.

The New Laurance-Wood Orthops Ophthalmoscope.

Every sight-testing optician realises the expedience of including, in his routine, an examination of the fundus, and equally he is acquainted with the difficulties attending such examination with the ordinary ophthalmoscope.

The latest and most perfected instrument for this purpose has been designed by Messrs. Laurance and Wood and can be obtained from any wholesale optical house.

The instrument is entirely reflecting, so that the reflexes and aberrations attending the employment of the refracting ophthalmoscope are entirely eliminated, and the construction is so simple that it is practically impossible for the instrument to become deranged in any way.

It gives a large field and a magnification of about ten diameters, and one of its great advantages is the facility with which any part of the fundus can be explored.

Those who have found ophthalmoscopy difficult need no longer do so, while those who employ it more or less successfully will be quite surprised at the clearness and stability of the view obtained with the new instrument as compared with the ordinary one.

The L-W Orthops Ophthalmoscope is entirely of British Manufacture, and is made by Messrs. George Culver, Ltd., White Lion Street, Pentonville, N. Its price is no higher than many of the ordinary self-luminous instruments at present on the market.

British Solid Bifocals.

Of the four best known forms of bifocal spectacle lenses, each has its advantage; and as questions of facility, price and appearance are factors in the issue, there is no "best form." Much interest attaches to the invisible "one-piece" type of segment; and it is becoming very popular in America, where the cemented wafer addition bids fair to become nearly as old-fashioned as Franklin bifocals. We are pleased to learn now that the manufacture of solid bifocals on a large scale has been undertaken by the United Kingdom Optical Co., Ltd., at Mill Hill, London, N.W. This firm

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

has installed the necessary additional machinery, having already secured manufacturing rights from the Bi-Liptic Company of their bifocal lens which is the latest refinement in ophthalmic lenses. The lens is ground from one piece of glass, the reading portion being ground upon a concave surface to a shallower curve than the distance. The reading portion is ground in either of two shapes, round or an oblong with round corners. The effect of the latter shape is to allow a portion of the distance focus to be below the reading, thus enabling the user to have a clear vision of the floor when walking, more especially downstairs. Most of these lenses will be ground in the meniscus form. The United Kingdom Optical Company will be pleased to send a chart showing curves for all combinations with the price list. Their descriptive booklet, together with a sample "Bi-Liptic" lens, can be had by every ophthalmic optician on application to his regular wholesale house.

OPTOMETRY IN FRANCE.

Mr. W. S. Todd, chairman of the Department of Education of the A.O.A., writes as follows:—

"Some time ago I received a letter from France asking about the work of the Department of Education of the A.O.A. with special reference to the Optometrical Courses of Study, and I replied telling of the work we are doing and also making various suggestions. The President of the A.E.P.O. (The Association for the Study and Perfection of Optics) sent a letter to be read at the National Convention in New York City. Accompanying the letter is a short note in French, the translation of which is as follows:—

"To Mr. W. S. Todd, Apostle of Optical Teaching.

"In the name of all our fellow-brothers, enemies of routine, and opponents to the 'Omnipotent gloom,' I am sending you our fraternal greeting! (Signed) Odin, President of the A.E.P.O."

The title of Apostle is a new one and I appreciate the honour our French Brother has bestowed on me.

The letter to the Convention is as follows:—

"The A.E.P.O. in France take the opportunity to address cordial greetings to the A.O.A. at its great National Convention in New York City.

"The French optometrists wish also to express their sincere thanks to Mr. W. S. Todd for the interest he has taken in the scheme of the A.E.P.O. who just now are working hard to transform in France the old-fashioned optician into a modern optometrist.

"This transformation is no doubt difficult to accomplish, peculiarly in this old country of France where there is to be found so many prejudices of conservative heredity which make an opposition particularly sad; owing to the ignorance of certain opticians, their desire not to make anything against that ignorance; the fear and opposition of a few almighty representatives of the medical body. These are some characteristic forms with which our association has to battle.

"The sale of optical glasses just now in this country is not regulated by law, therefore, anyone in France can establish as optician; next, the teaching of optics is quite unsatisfactory as far as optometry is concerned. It is true there is an Optical School in Morez-Jura, but the urgency of the latter provides only for the preparation of, may we add, good optical workers in all branches, save refraction and skill in optometrical science.

"About ten years ago a few French opticians started to give up routine; and they are now transformed into optometrists; they belong to this Association; unfortunately there are a few yet outside worthy of the name 'optometrist,' although still refractory, we hope they will become members of our organisation shortly.

"Amongst the French optometrists there are a lot who have followed their courses of study in America, England and France, the latter from our association the A.E.P.O. and private teachers in optometry; to be short, they are all successful in their practice.

"Now for the worst side—we sadly acknowledge that most of the time the opticians in this country do not examine or measure the refractive errors of the eye but sell spectacles and eyeglasses ready made, taking in a drawer a few pairs they merely present the glasses to the client and with ceremony ask with this one you can see, or with this other one it is better, and the etiquette goes so far as to let the prospect select the glasses he thinks best for himself.

"But when ametropic cases present themselves they may go as far as testing each eye separately. They use a distance chart for

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

ARCHERS

Offer interesting Specialities in the following lines:

GOLD SPECTACLES, EYEGLASSES and FRAMELESS MOUNTINGS.

TORTOISESHELL SPECTACLES and EYEGLASSES.

ORBITO SPECTACLES.

LORGNETTES and LORGNONS.

TRIPLEX GOGGLES.

OPERA GLASSES.

PRISM BINOCULARS.

R. ARCHER & SONS, Ltd.,

1, AMWELL STREET, LONDON, E.C.1

Digitized by Google Original from THE OHIO STATE UNIVERSITY

CLINICAL THERMOMETERS

Enlarging Lens, Nickel Cases, all passed N.P.L. test 1921. 1 minute and ½ minute. Veterinary Do.

Accurate chemical Thermometers 110°c, 150°c, 200°c, 360°c, 250°F, 300°F, 400°F. Special high range 550°c: Also sets and separate in graduations to $\frac{1}{10}$°.

Horticultural Registering Thermometers, Metal Frames, Opal front, with magnet. Also Dairy, Bath, House and "Baby" Thermometers in screw case, Artificial Eyes, &c.

MUCH BELOW USUAL PRICES.

CHEELD, CHESHAM, BUCKS.

ARE YOU AWARE

of our facilities?

IF NOT:—PLEASE WRITE FOR DETAILS.

WE SUPPLY

OPTICAL GLASS.

MOULDINGS!

In Every Shape and Form.

REYNOLDS & BAILEY,

15-19, Vine Street, London, E.C. 1

Spectacles
R'less Spects.
R'less Mounts
Monocles

Manufacturer of

GOLD

in 9ct, 12ct, 15ct.

Astigs
Folders
Rigid Clips
Odd Mounts

Special Frames.

Stock Orders.

ALL GOODS GUARANTEED OF FINEST ENGLISH WORKMANSHIP

FRANK BUTTERWORTH, *(Estab. 1898)*

4, TENBY STREET NORTH, BIRMINGHAM.

TURNERY WORK IN EBONITE

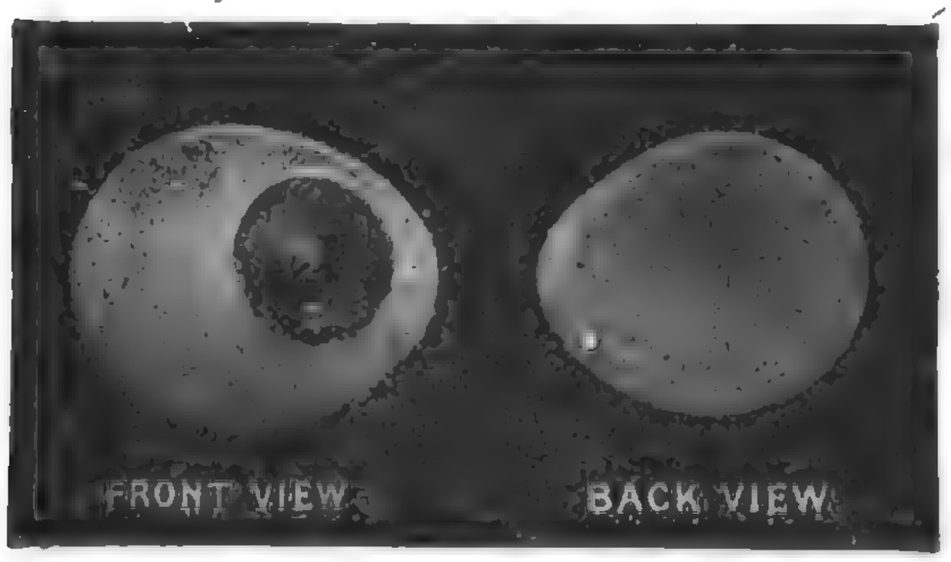
Small turnery work of all kinds undertaken. Rod and Sheet supplied in any quantity, cut to order. **Enquiries Solicited.**

BURGE, WARREN & RIDGLEY LTD.

91 & 92, GT. SAFFRON HILL, LONDON, E.C.1

SNELLEN'S IMPROVED ARTIFICIAL EYES

PACHE & SON, 75, Station St., Birmingham.



MAKERS TO THE PRINCIPAL HOSPITALS.

Selections sent to Surgeons. Also Makers of the ordinary Shell Eye.

F. BARKER & SON,LTD.

SUNDIAL HOUSE,

12, Clerkenwell Road, LONDON, E.C. 1

Registered Trade Mark Estab. 1848

MANUFACTURERS OF ALL CLASSES OF

SCIENTIFIC AND OPTICAL GOODS.

MANUFACTURERS OF

Aneroid Barometers, Compasses, Drawing, Mining, Surveying & Scientific Instruments of Every Description.

Illustrated and Descriptive Catalogue Post Free to any part of the World. Illustrated Booklet upon Sundials, Barometers and Compasses, Post Free. LISTS FREE.

Correspondence Invited. **Bankers' and Trade References.**

CLINICAL THERMOMETERS A SPECIALITY

FINEST ROUGH CYLINDER BLANKS.

Also good 2nd Selection
A very attractive proposition for Export and cheaper work.

CHANCE'S GLASS USED.

ACTUAL MANUFACTURERS

ASSOCIATED OPTICAL WORKS, Ld.

5, Queen's Buildings, London, W.1

Near Tottenham Court Road.

No Connection with any other Firm. **Telephone: Museum 2216.**

Telephone **JAMES B. SLY,** Central 10280.

9 & 10, EDWARD ST., WARDOUR ST. LONDON, W. 1

To S.M.C., B.O.A. & I.O.O. DIPLOMA HOLDERS

Oak frames and modelled gold Arms for the diplomas The Arms of the S.M.C., City of London, and devices of the I.O.O., B.O.A. and Ph. Society in water colours, and framed dark oak, with descriptive engraved plate affixed, 27/6 each. Packed and put on rail.



Printed & Embossed Optical Stationery.

Steel Dies for use of Diploma Holders.

Electros of Coat of Arms & Optical Devices.

Engraved Seals, Prescription Forms, Signs, etc.

Price List on application.

Electro No. 12 Price 3/6

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

myopia, hypermetropia, but if astigmatism is so pronounced that spherical lenses are not sufficient the fear of Dr. X or Y makes its effect and they send the client to get a prescription from Doctor So and So. The apprehension of the medico-oculist is the nightmare of some French opticians; one must not however conclude that there are no optometrists in France, this was almost true ten years ago but now refractionists, of whom we would like to see the number increase more rapidly, are using in their daily practice, ophthalmoscopes, retinoscopes, and ophthalmometers. These practitioners of objective and subjective methods are to be found not only in Paris but also in the Provinces of France. They have all urged their confrères to follow their example as adepts of the science of skiascopia. Now in what way are they received whenever they go to preach the new Bible-of-Optometry to their fellow men? By objections like these, demonstrating very well the cause of evil enumerated in the beginning of this report.

"Ignorance! the desire not to do anything against that ignorance! the fear of the medical body!

"1st Objection. 'You tell me to practice optometry. What for? My father to whom I succeed was not practising it; he has made his living just the same, and why should I begin to study, what's the good?'

"2nd Ojection. (More frequent). 'Why man! to practice optometry would take too much of my time with a client; this would be endless. What would Dr. X say if he ever happens to know that I select glasses that way? He would send his prescriptions to another man.'

Medical Scheme Countered.

"May we be permitted to recall the following fact. A few years before the great war the Medical Association of French Oculists prepared in a background way a Bill tending to forbid the sale of all optical glasses without an ordinance of a doctor-oculist. Naturally they insinuated the ignorance of the opticians while introducing the bill to the Minister; also that the eyes of the public should be protected against the ignorance. This claim could have been accepted by the Ministers, but a few opticians saved the situation; they saw the danger of such a law which would not only have prohibited the opticians from making a refraction, but would have taken away their right to make a living, and it would have given the druggists in this country the monopoly of the sale of all optical glasses, and legally this monopoly would have been bethrothed only to the druggists owing to their Government diplomas. There is no need to say that the latter would have eagerly claimed that privilege. The Ministers did not go on with that Bill, the protestation of a few opticians made good.

"Unfortunately after that experience the renewal of the status-quo began. The opticians should, with unconcerned routine, have availed themselves of the lesson for the future so that the N.D. would attempt no more. They should have demanded the institution of a Board of Examiners in Optometry but they failed in their duty. It is also fair to say that the A.E.P.O. was at that time in a state of infancy.

"To close these remarks and resume the present situation of Optics in France.

"1st. There are now many opticians who know how to use the trial-case, and although having a thorough knowledge of the details of subjective methods content themselves in selling eyeglasses ready-made.

"2nd. There is a restricted number of opticians practising optometry specially in objective method; useless to say it is the latter who give some life to the A.E.P.O. This organisation struggled with all its power against the ignorance and routine so as to make known the study of optometry, and transform the old-fashioned optician into a genuine optometrist. We admire the grand work of the American optometrists who give such a splendid example of professional progress.

"In France the lovers of the science of optometry know that in America the optometrists are wonderfully educated, and well-equipped to efficiently care for the public's eyesight. They also know they are wonderfully organised and united.

"In France this undertaking is in a state of infancy but we firmly have the will to realise our programme and there is no difficulty to discourage us.

"'Willing to overcome,' is our motto. Therefore we desire to be in communication with our fellow brothers of America to whom we address over the ocean our best greetings of fraternity."

The Dacol Prism Binoculars.

We are pleased to learn that Messrs. Davies, Coleman & Co., Ltd., manufacturing opticians (15, Fetter Lane, E.C.), have been honoured by the fact that H.R.H. the Prince of Wales has purchased one of their "Dacol" prism binoculars for his personal use in India.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Relation of Illumination to Visual Efficiency.

As we know more of the processes involved in either work or study, we realise that if one is to make any adequate use of his powers, he must see distinctly and without abnormal fatigue. For this reason, the last decade has seen a great deal of study applied to the practical conditions which affect both visual acuity and comfort.

For the most part, says a writer in the 'Western Optical World,' these studies have been directed to the diseases and functional defects of the eyes themselves. Until recently no very great attention has been paid to the conditions under which the eyes were to be used. We are just beginning to appreciate the fact that ability to use the eyes may vary within wide limits as the conditions are favourable or unfavourable, and as a result, a critical investigation of the factors in this ocular efficiency is in progress. One of the most important of these factors is illumination, and we are getting farther away from the old idea that the best lighting system is one that gives us the most light for the least money.

The illumination of most buildings, whether public or private, has been planned by the architect, frequently without expert knowledge, and so made a subordinate feature. The location and capacity of lighting fixtures and even of windows is too often considered from the standpoint of decoration rather than utility. While there is much dispute over minor details, the general principles of illumination are pretty well established, and apply not only to schools, but to the factory, office and the home. Let us consider for a moment the physiological standards under which we must judge the value of light, whether it be natural or artificial.

When light falls on the retina it excites certain photo-chemical changes, which are proportionate to the intensity of the light and the length of the exposure. A light may be so dim as to cause too little reaction for us to perceive it, while on the other hand, it may be so strong as to exhaust the visual purple and leave the eye temporarily incapacitated. We seek a happy medium, though the amount of light needed will depend largely on the nature of the task pursued and the sensitiveness of the eyes employed.

The efficiency of the illumination should never be judged from the brightness of the light alone, but from its effects on what one is trying to see. One can learn to determine for himself, in a rough way, the amount of light he needs, by gradually increasing the illumination until further increase fails to improve the sharpness of vision. Evidently, less light will not permit the maximum of acuity, while more wastes the visual substances and lessens the maximum of use. To be more exact in our measurements, we have a number of so-called photometers which enable us to compare the brightness of light falling on any given spot with the light from a standard candle one foot away.

But after all is said and done, the human eye is one of the best photometers if one is careful not to injure it in the process, since it is on its adaptability to the eye that all light might ultimately stand or fall. Some eyes need more light than others, but, in a general way, we can say that from two to three foot candles is illumination enough for ordinary school and office work, though this will depend somewhat on the colour of the walls and the work and the general brightness of the room.

Within limits, the retina, as we say, "adapts" itself to extremes of light, so that one can become accustomed to working in a light which dazzled him badly at first and can, after a time, see surprisingly well in light which is not far from absolute darkness. Intense and long-continued exposure to bright light causes retinal exhaustion, and the retina becomes capable of reacting only to powerful stimulation. In other words, that retina is, for the time being, blind, except in the brightest of lights. Everyone has experienced the comparative blindness caused by going from bright sunlight into a dimly-lighted room. It is a common experience to have workmen insist on having as intense a light as possible because they have temporarily so blunted their retinal sensitiveness that they are helpless without it, and it is generally the hardest kind of task to convince them that even if they suffer no harm from the glare they cannot possibly work as long without fatigue.

In another set of people, the retina, instead of being blunted, becomes hyperesthetic, and finally almost incapable of bearing any exposure to light at all. This condition is seen at its worst in hysterics, when it is, of course, not a result of overlighting. But there are a number of occupations, like those of the gilders and polishers, whose workers have

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Seven Styles

now made in

"OCENTRIC" EYEGLASSES

BRITISH MADE.



A Distinctive Model for Each Individual Taste.

RIMLESS MOUNTS & FRAMES. G.F. & SOLID GOLD.

O series Short Plaquets Regular pattern
100 „ Normal Plaquets Regular Pattern
200 „ Long Plaquets Regular Pattern
300 „ For Centrally Drilled Lenses
(BENT UP PLAQUET ENDS.)
400 „ For Centrally Drilled Lenses
(CLAMPS ATTACHED BY SHORT BRACKET.)
700 „ For Centrally Drilled Lenses
(SWAN NECK BRACKETS.)
800 „ Regular Pattern with Double Straps

SAMPLES and PRICES WILLINGLY ON APPLICATION.

The British Ocentric Optical Co., Ltd.,

Wholesale and Manufacturing Opticians,

12 & 13, EAGLE STREET, SOUTHAMPTON ROW,

LONDON, W.C. 1

Telegrams—Ocentricco, Westcent, London. *'Phone—Holborn 560*

Cables—Ocentricco, London.

B

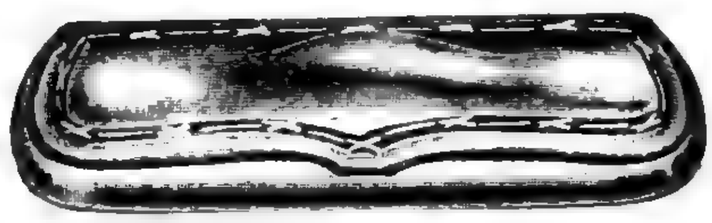
Digitized by Google Original from THE OHIO STATE UNIVERSITY

MAKE A NOTE OF THIS PAGE

ALUMINIUM SPECTACLE CASES.

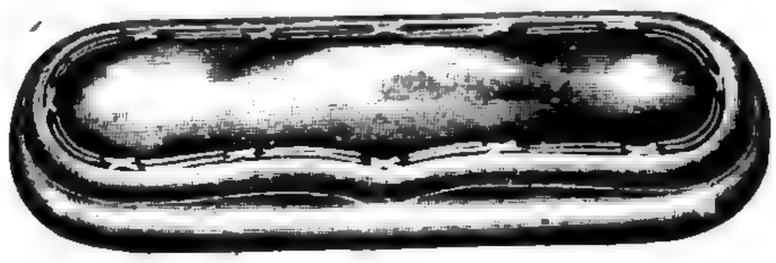
We have pleasure in submitting a few illustrations of these goods.
Prompt delivery from stock.

Nos. 1—10—20.



Plain, Plain with Fancy Border and Embossed.
Astig 2—1—0 Eye.

No. 110.



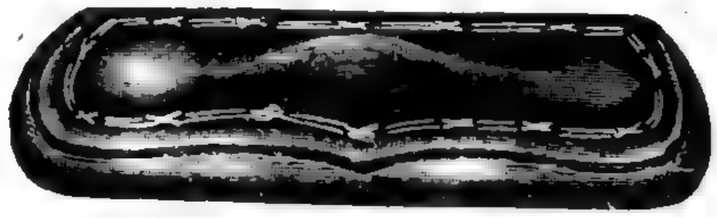
Fingerpiece Extra Large Curl Side.

WELL-FINISHED WITH STRONG SPRING LIDS. CHAMOIS LINED

—o—

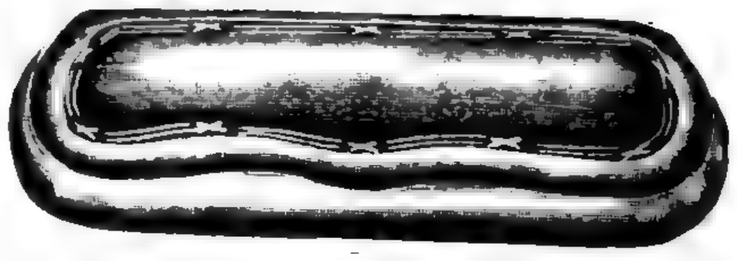
PHONE OR WRITE for FULL ILLUSTRATED LIST OF THESE CASES.

Nos. 14—24.



Oxydised Astig.

No. 210.

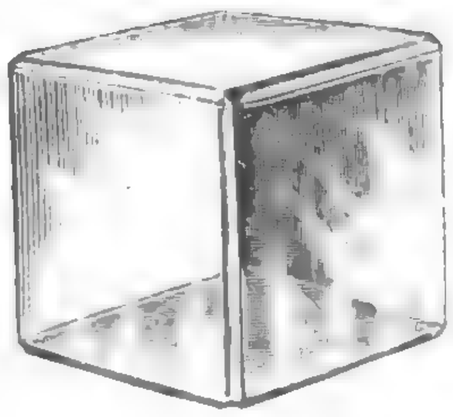


Round Eye Fingerpiece.
2—1—0 Eye.

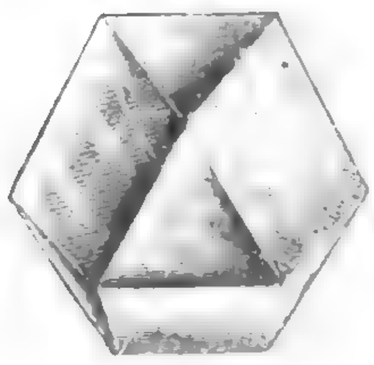
GLASS DISPLAY STANDS

Effective Designs in 4 Colours.

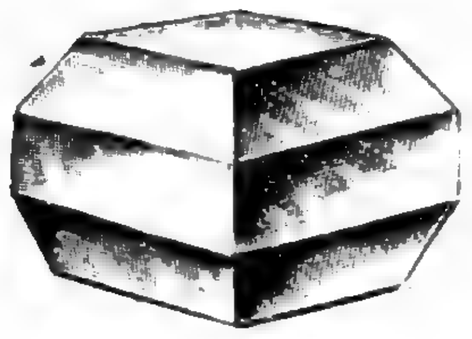
No. 12310



No. 12311

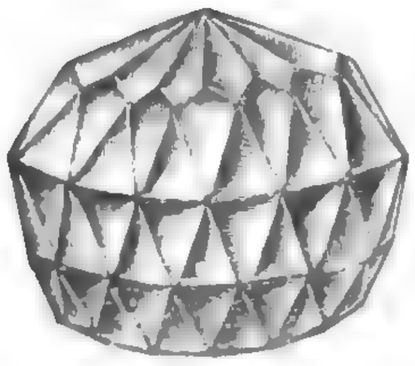


No. 12312

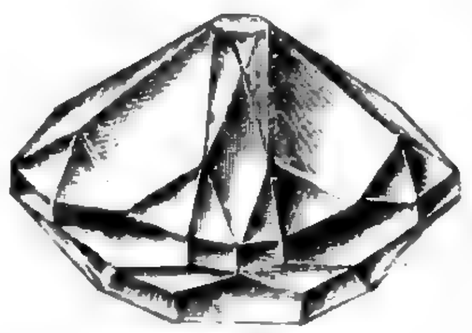


Wholesale Prescription Trade Only Supplied.

No. 12313



No. 12314



LENSES.—Prices of our Lenses are not being increased at present.

JULES LANG & SON,

CHARLTON WORKS, CHARLTON PLACE, ISLINGTON, LONDON, N.1

'phone—NORTH 2770-2 (3 lines). *Telegrams—"ASSORTED" phone Lon.*

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

their attention fixed for long periods on bright surfaces, in which case retinal weakness is very common. Indoor workers as often suffer accident from too much light as from too little.

Exact photometric measurements show that the light of ordinary incandescent lamps concentrated at the cutting point of a tool or a work bench is often several times the intensity of daylight. But the eye adapts itself to the intensity and when the workman turns from his overlighted work, perhaps in a room full of moving machinery, he is practically blind. What is needed from the point not only of safety, but of health and comfort, is much less intensity and much better diffusion of light.

The effects of light on the eyes are practically the same whether it shines directly into them or is reflected. If the reflecting surface is polished, practically the whole amount of light reaches the eyes, while if it is a rough or mat surface, the light is broken up and reflected in all directions, while the details of the surface itself become visible. If one looks at a reflexion of the sun in a mirror, he is in effect, looking directly at the sun, while if he substitutes for the mirror, a printed page, the direct reflexion or glare is in proportion to the polish of the paper, while the visibility of the print depends on the character of the surface. The eye is much more sensitive to glare coming from below, as from water or sand, and it is quite possible to have light enough reflected from a polished desk-top or from shiny white paper, to cause perceptible eye discomfort and fatigue. This is particularly true of the intense light reflected from the bare filament of the incandescent bulb.

Abnormal fatigue is admittedly one of the greatest predisposing causes to most diseases, be they physical or mental, and though the part played by bad lighting is perhaps not clear-cut, it is beyond doubt. In most factories, schools and offices, the eyes must do work they were never intended for. The result even in normal eyes is a muscular and nervous fatigue which is measurably increased by either over, or under, lighting. The first engenders fatigue from retinal exhaustion and pupillary spasm, while the second results in the strain that follows sharp focusing and constant attention. In the majority of individuals whose eyes are handicapped by astigmatism or other refractive errors, the strain is still greater. There are a long list of conditions of health which rightly have been attributed to eyestrain. Some of these are beyond dispute, while others are still in question.

X-Ray Cancer Treatment.

Remarkably successful results in the *x*-ray treatment of cancer are being obtained at the London Hospital, Whitechapel, says the 'Daily Mail.'

"It is too soon to make a definite claim of permanent cure. At least 5 years must elapse without recurrence of cancerous growths before it can be confidently said that the disease is cured. But one of the cases described at the hospital is almost miraculous. A doctor, in whom seven surgeons diagnosed cancer, and regarded the case as hopeless, submitted himself for treatment with *x*-rays. Death had seemed certain within a few weeks, but he is now back in active practice. Many other patients have been treated with similar success, although their cases were not so desperate. It has been found that a patient must have sufficient reserve of power to stand the treatment, but when this is present the cancerous growth can be controlled. That is definitely established. The distinguishing feature of the method is that it aims not only at destroying the local cancer but also at killing the cancerous cells wandering through the body which give rise later on to tumours in other parts of the body. This is the only way in which a permanent cure can be hoped for. It is advisable that the surgeon should first remove by operation as much of the cancer as possible and that the *x*-rays should follow, to kill the cancerous cells in the blood. About 50 patients are treated in the London Hospital every week by apparatus designed by a London medical man and of British manufacture."

"Bondwell" Football Club.

(C. W. DIXEY & SON.)

Played at Lea Bridge Road on Saturday, October 22nd. Both teams were well represented and a very strenuous game was witnessed. Urswick had an unbeaten record, and enjoy a big reputation in the district. They played pretty football throughout, placing the ball accurately and shooting with precision. Although the "Bees" initiated a number of attacks, they never succeeded in penetrating the home defence. Result: Urswick Athletic, 8, Bondwell 0.

On Saturday, October 29th, the "Bees" oppose Mildmay F.C., at home, Lea Bridge Road. Supporters are cordially invited.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Momentary Character of Visual Stimuli.*

By PERCY W. COBB, M.D.

Reflection upon the performance of the eyes in ordinary use shows that the instances in which the eyes remain in one position for a period such as three seconds, or even as much as a considerable fraction of a second of time, are rare; or they do not pertain to situations as are implied in the phrase, "use of the eyes." Instances in which the eyes remain stationary or nearly so for gross periods of time are:—

1. Sleep, narcosis, coma and other states, medically known as states of unconsciousness.

2. The condition known as "brown study" —periods of abstraction in which one is caught perhaps, "gazing into space," and in which, although the eyes appear to be in fixation, the object (if any) upon which they are fixed is, to say the least, remote from the centre of attention.

3. The case of the observer in the laboratory where certain experiments in psychology and physiological optics are in progress which call for prolonged fixation. In such cases it it noteworthy that the brightness and colour differences in objects tend to disappear, and that troublesome after-images are apt to take place on change of fixation.

4. Also the somewhat unusual case of ordinary vision, including perhaps phases of certain special pursuits, when the object viewed is close to the threshold for the fovea and the observer gazes at it fixedly to arrive at a judgment.

The outstanding fact is, that in the "use of the eyes,"—in sewing, reading, checking and copying, and in "taking in" a drawing or a picture or the lay of a set of objects in space —the eyes are rarely more than momentarily at rest. According to Huey ('Psychology and Pedagogy of Reading,' New York, 1908), the movements executed by the eyes in reading occupy 0.04 to 0.06 second, while the average duration of the fixational pause he finds to be 0.19 second in one case, 0.11 in another. Dodge ('Zeitsch. f. Phychol., lii., p. 373) states that the shortest adequate pauses photographically recorded in one of his experiments are 0.070 to 0.100 second. Certainly is this true of such work as is commonly accounted as "trying" to the eyes.

It is due to Troland, ('American Journal of Psychology,' 1914, xxv., pp. 500-27; 'Transactions of the Illuminating Engineering Society,' New York, 1916, No. 9, pp. 917-66, and 'Journal of the Optical Society of America,' i., 1917, pp. 3-15) starting from Hering's viewpoint, that the development of a new phase of the theory of vision has been forwarded, in which the change of state of the retinal elements is given first importance, and the conception of the (so to speak) one to one representation of stimulus-brightness in retinal response has been pushed into the background. Upon this hypothesis, granted that a stimulus of constant intensity continues to fall upon the same retinal area, the physiological condition in that area tends towards a certain state of equilibrium and approaches that state at a rate greater according to its remoteness from that state, somewhat after the manner in which the temperature of a body tends towards the temperature of the medium in which it either takes on or loses heat. Removed to a medium of different temperature, the body will at once tend towards the new temperature, by the same law, at a rate proportional to the temperature difference.

Similarly with the retina. The temperature of the medium represents that particular state of physico-chemical equilibrium in the retina which would hypothetically be induced by the continued action of the constant stimulus; a terminal state which the retina can, under constant conditions, be conceived to approach indefinitely without reaching it in any definite time. A new stimulus acts, and the retina begins a change of state, initially from whatever state it is in, towards a new terminal state; the initial change being the more rapid the more remote the new terminal state and *vice versa*.

But with the saltatory behaviour of fixation, which has been well demonstrated by photographic records of the eye-movements executed in reading, no part of the retina—or at least not all parts critical in recognising a given detail—can be conceived to reach a state of equilibrium, unless by way of a rare exception. The rule will be that a given retinal element only begins to make a change towards a certain state, when the process is cut short by a shift of fixation, before a state

* Abstracted from 'Phychological Review' in the 'American Journal of Physiological Optics.'

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The National Association of Opticians.

President:
Mr. A. HERSHBERG, Manchester.
Hon. Secretary:
Mr. E. MOEVIUS.
17, Rathbone Road, Wavertree, Liverpool.
Mr. C. ADAMS, Oldham.
Mr. T. S. BAIRD, Glasgow.
Mr. T. BEARDSALL, Manchester.
Mr. D. R. JONES, Liverpool.

Vice-Presidents:
Mr. W. J. S. GREEN, Birmingham.
Mr. R. CHALMERS, Sunderland.
Hon. Treasurer:
Mr. H. W. DAYKIN,
5, King Street, Allreton.
Mr. J. W. OBERLE, Manchester.
Mr. L. MORETON PARRY, Liverpool.

Hon. Solicitors:
MESSRS. ARTRO MORRIS & CO., Solicitors, 2 & 4, Harrington Street, Liverpool.

A NOTABLE EVENT IN 1922



Will be the inauguration of Qualifying Examinations in Visual Optics and Practical Sight Testing under the auspices of the above Association and which will be open to all Sight Testing Opticians throughout the British Isles and Elsewhere.

The Terms, Conditions and Syllabus—presently to be formulated—will be announced later.

NOTE:—Forms of Application for Membership may be had from the Hon. Secretary. The Subscription is 21/- yearly, which includes free delivery of "The Optician."

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

of equilibrium is even approximated.

Now what happens when, as in most experiments on visual thresholds, a part of the retina of a fixated eye is subjected to stimulation for one-half or one or several seconds? And what bearing has this on what happens to the retina in the case in which such a stimulus is cut off in a few thousandths or hundredths of a second? Obviously, the two occurrences bear a certain mutual relation, but the latter represents the initiation of a change while the former represents more nearly the final stages of the same sort of change; the former is a type of stimulation whose result must be conceived to depend more largely upon the terminal state corresponding to the continued action of the stimulus, while the latter will give a result depending upon the quickness of the retina to respond, a result which, it is believed, is more truly representative of the behaviour of the sense-organ in the course of its every-day performance.

By way of thesis, for experimental verification or refutation, the following may be laid down:

1. Every-day vision involves, as a rule, only momentary fixation, during which most of the details of the total impression are taken in, not by the fovea, but by the parafoveal retina. Possibly the peripheral retina is best adapted to momentary stimulation. At least it may be said that the peripheral retina is highly sensitive to change of stimulus; and also to movement, which, when analysed as a stimulus, resolves itself into changes of stimulation of retinal elements.

2. The adequate stimuli to such vision are *a priori* by no means identical with those adequate to the foveal retina, especially when in the latter case the time of exposure to the stimulus is one of longer duration, as in the practical vision of a barely-visible object.

3. The conditions of eye fatigue and eye-strain are to be sought, not in relation to the usual and more or less episodal performances of the eyes; but rather in relation to such performances of the visual organs as are the rule in the course of their ordinary use.

In detail, such performance of the eyes as is the rule in typical eye-work, as in reading for example, consists in successive momentary fixations, in which details of the words and of the letters forming them are impressed chiefly upon the parafoveal retina; and in sudden leaps from one point of fixation to the next, during which it seems probable that no neural impulse originating in an impression upon the retina is able to take part in the sensory integrative process.

The Orbito Spectacle Ware.

The Optical Products Company (Worcester Street, Birmingham), who are inventors and patentees of the Orbito non-pressure glasses, offer to send booklets and samples to members of the trade. An illustration which appears in our advertising columns shows that the bridge of the Orbito frame does not touch the nose.

Stellar Photography.

The announcement is made that by means of specially sensitised plates and a deep red colour screen, stars down to the sixth magnitude can be photographed in full daylight.

Glass Moulding.

Messrs. Reynolds and Bailey (15-19, Vine Street, E.C.1.), invite inquiries for any form of moulded optical glass, as they have specialised in the production of such mouldings.

The Clinical Thermometers Bill.

With reference to the communication printed elsewhere on the subject of standard tests for clinical thermometers, it may be mentioned that Mr. Stanley Baldwin has stated in Parliament that the Government expects to reintroduce the Clinical Thermometers Bill next session.

THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER

Subscription Form. **123-125, Fleet Street, London, E.C.4., England.**

Send a copy each week of THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER post free for which we enclose .....shillings for.....weeks.

UNITED KINGDOM 17s.
and ABROAD 20s.

Name.....
Business.....
Address.....
.....

A remittance of 17s. (or 20s. Abroad) for 52 issues includes "THE OPTICAL ALMANAC" post free.
Cheques made payable to The Hatton Press Ltd.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

F. H. C. Lyon,

Full Stocks :-

12 ct. 1/10th Cable & Straight Side Frames.

Solid Gold Cable Frames & Astigs.

American and English Cases.

Lenses Uncut and Edged.

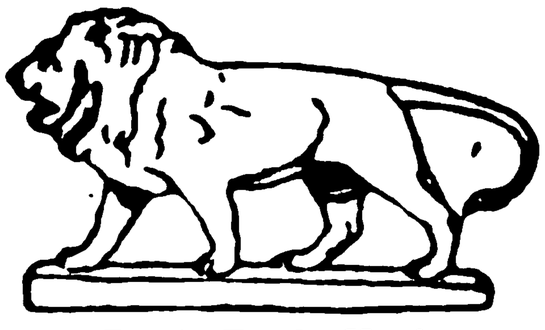
Samples and Prices on Application.

Rx Work a Speciality.

Wholesale & Manufacturing Optician,

59-61, Hatton Garden, London, E.C.1

Telegraphic Address :
CYLTORREXO, SMITH, LONDON.

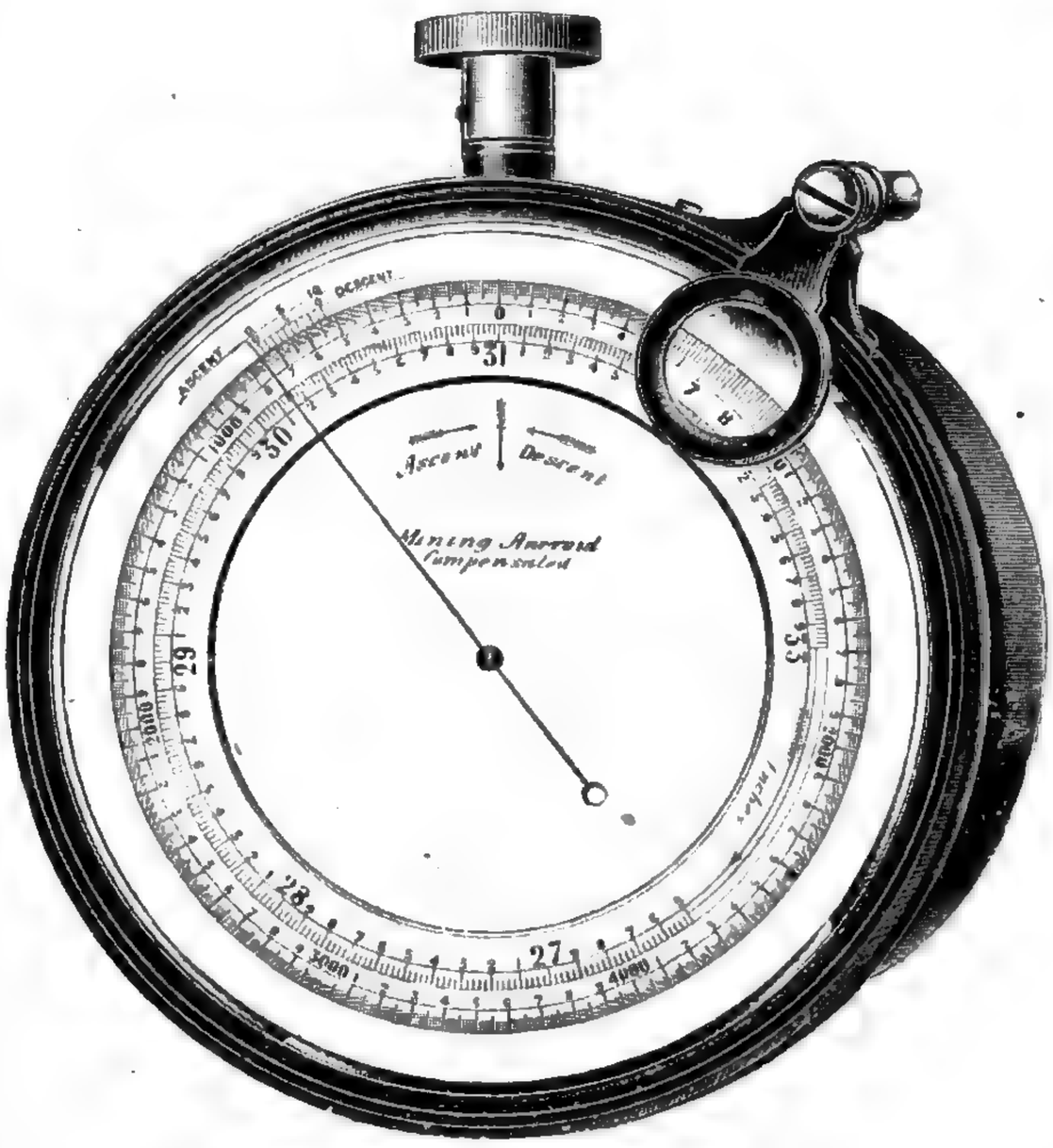


Regd. Trade Mark.

Telephone No. :
HOLBORN 1203.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY



SURVEYING and MINING ANEROID with Rack Vernier giving readings to single feet, made in sizes 3 in. and 5 in. Diameter. Nos. 562 and 563.

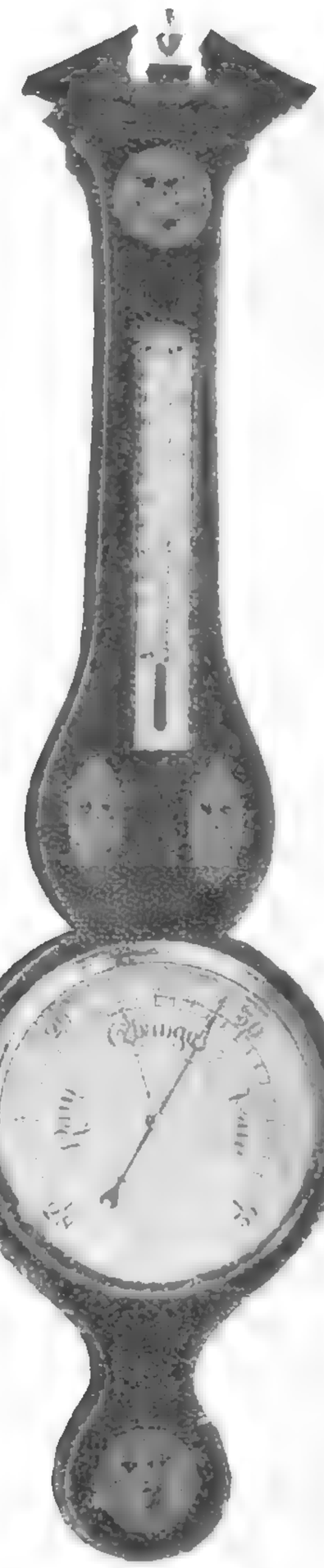
T. WHEELER,

Aneroid Barometer

and

Scientific Instrument

:: Manufacturer. ::



Specialities:

POCKET

SURVEYING

and

AERONAUTICAL

ANEROIDS.

BAROGRAPHS.



No. 505.

WATCH FORM ANEROID with Mountain Scale.

217,

GOSWELL RD.,

LONDON, E.C.1

ESTABLISHED 1878

Telephone: CITY 419

Telegrams:

"Scienoid, Isling, London."

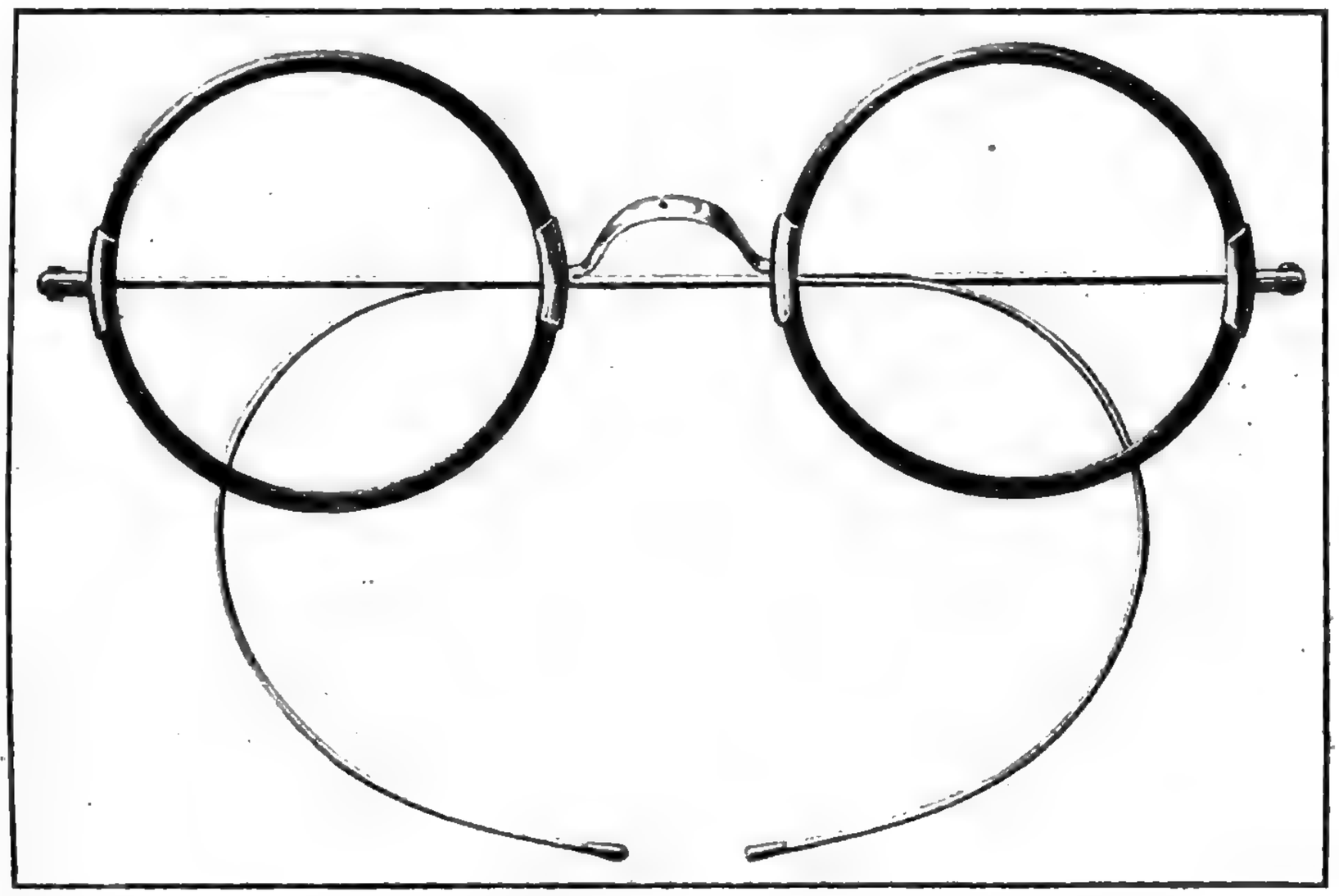
Contractor to H.M. Government, the War Office, Meteorological Office, Air Board, etc.

No. 1000 (8" Metal Dial)
PENDANT ANEROID BAROMETERS
Sheraton Pattern Inlaid
Solid Mahogany Frames.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"PAMELLA"
THE DAINTY.





Elegant in appearance yet strong and reliable in wear, the "Pamella" Spectacle features extreme neatness.

Individual taste is provided for by the various combinations in which the "Pamella" spectacle is manufactured.

The Gold-filled fittings, guaranteed 1/10th. 10 ct., and gold soldered, are combined with wine colour Zylonite rims, Crystal rims and Horn colour rims.

The same combinations for Fingerpiece wearers are supplied by the "Fitswell"—The durable Fingerpiece clip with the combination of Imitation Shell.

"FITSWELL"
IT FITS WELL.

E. BITTNER, Ltd., 59, Hatton Garden, London, E.C.1

To the Wholesale Trade Only.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

SCIENTIFIC INSTRUMENT MAKERS.

MICROSCOPES of all kinds manufactured at our own works.

REPAIRS to Prismatic and other Binoculars, etc. promptly executed.

H. H. SHARLAND (H. KEMP)
9 & 10, THAVIES INN, HOLBORN CIRCUS, LONDON, E.C.
Trade Marks "AURORA" "LUSTRA"
TEL.: HOLBORN 4840
ESTABLISHED 1860

Every Description of Ophthalmic Supplies.

All requirements of the up-to-date Sight Testing Optician.

Excellent Special Lines at the Right Prices.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

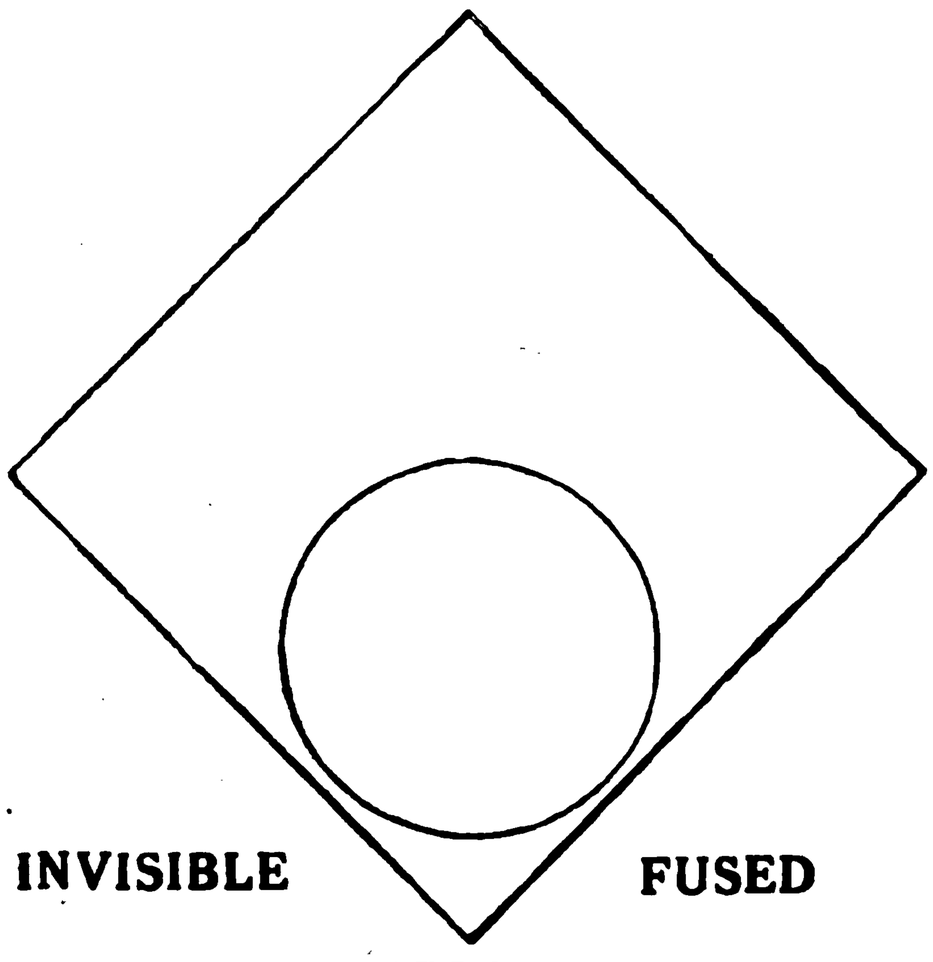
Trade KRYPTOK Registered Mark.

Notwithstanding the extraordinary depression in trade which has affected the Country for the past year, the demand for the Kryptok Fused Bifocal has increased, and facts of this nature testify eloquently to the trade possibilities of this invisible double-vision lens.

A Word to the Retail Optician.

What has been your share of the remarkable volume of trade which the Company's sales indicate? If a fair portion has not come your way the reason should be sought, and prompt measures taken to secure that fair portion.

A visit to a number of towns in England and Wales disclosed the fact that only a small percentage of Retail Opticians had any exhibit of our show cards or demonstration sets, and the number that made use of our newspaper electros and cinema slides was comparatively small. The remedy for small sales is therefore simple. Do not wait to be asked about Kryptok Bifocals, but call attention to them in your windows and in your local press and cinema houses.



We supply a considerable quantity of advertising matter gratis. Make use of this and watch the effect on your sales.

We are just issuing, in addition to our other matter, two new show cards particularly suitable for small windows. Samples of all matter will be sent on receipt of card.

ADVERTISING MATTER.

LITERATURE.

Well written and artistic eight-page leaflet, illustrated. Gratis upon application.

Two single-page leaflets, thoroughly striking and interesting. Printed with your name and address at the following charges:

250	5/6
500	7/6

WINDOW TRANSFERS.

These will be supplied gratis upon application.

NEWSPAPER ELECTROS.

These are supplied on loan for local advertising, and generally consist of an effective illustration with a few phrases bringing out some striking feature of the Kryptok Invisible Fused Bifocal. An illustrated list showing all the latest electros can be had upon application, but no new electros can be supplied until all the old ones, which may be in the possession of any retailer, are returned to us. All electros are loaned free of charge.

SHOW CARDS & DEMONSTRATION SETS.

Show card in three colours entitled "Preserve your youthful eyesight as you journey through the Years." Gratis upon application.

New combined show card and four-piece demonstration set by which the four last stages of the Kryptok Invisible Fused Bifocal are shown. The pieces are attached to the bottom of the card by metal clips. The price, which represents part only of the cost, is 10/6 Nett.

New show card in blue, white and red which explains in simple language the four-piece demonstration set which is supplied with it. In this case the pieces, which consist of a crown glass depression, a segment polished to curve, a fused blank and a finished lens, are not attached to the card, but to a metal upright embedded in a circular glass base. The charge for this original and very effective set is 13/6 Nett.

CINEMA SLIDES.

High grade cinema slides in full colours, including your name and address, 4/6 each Nett. These slides can be selected from an illustrated list which we will send upon application. The small charge made represents the actual cost to us.

KRYPTOK, Ltd., Letchworth Garden City, Herts.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

A Novelty of Real Merit which will Please Your Customers.

Write for Samples.

The "Autocrat" Monocle



With the Patent Spring-Grip.
THE IDEAL MONOCLE
For Comfort and Elegance.

FROM ALL HIGH-CLASS OPTICIANS & STORES.

Sole Manufacturers under Patent Rights—

J. B. Jacquemin Bros. Ltd.
65, Hatton Garden, London, E.C. 1

Display The Patent "AUTOCRAT" Monocle and Increase Your Sales.

Write for Samples.

(Reproduction of Advertisement from the Public Press.)

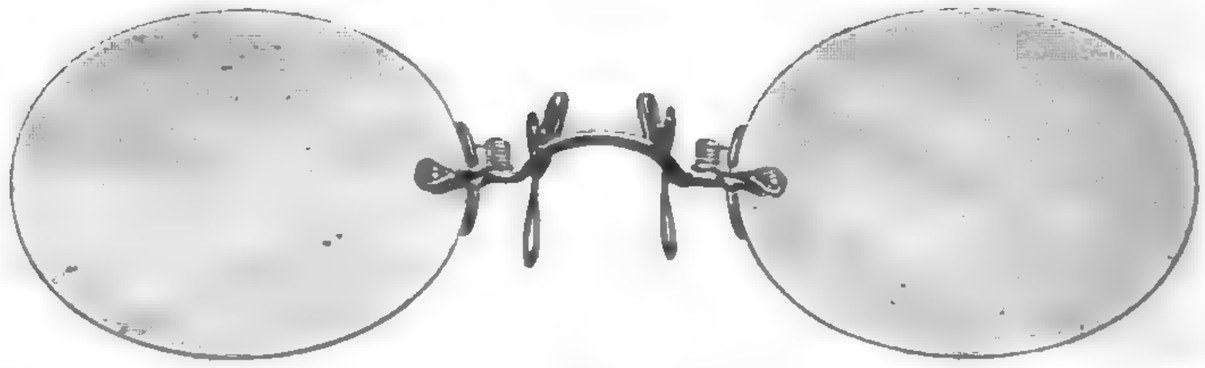
Jacquemin's Gold-Filled.

Buy French Gold-Filled Goods

and take advantage of a favourable

RATE OF EXCHANGE.

1/10th



12 ct.

FULL RANGE OF FITTINGS IN STOCK.

Write for Samples and Prices to your Wholesaler or direct to:

J. B. JACQUEMIN BROS., Ltd.,
65, Hatton Garden, London, E.C. 1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

CHANGE OF ADDRESS.

Cameron Works, Manor Park,
London, E.

Messrs. H. C. Ryland & Son, Ltd., beg to announce that their present lease having expired they have acquired a new works and after Nov. 9th. their address will be

"OPTIC" WORKS,

Lower Richmond Rd., East Sheen, London, S.W. 14

The Prefix is alright but what really counts is

THE SUFFIX

Crookes glass dates back to say 1913, and made by anyone is original and genuine, but it is important to remember that applies only to Sir Wm. Crookes A and B Glass. Since that date much water has flowed under London Bridge and Sir William only ceased his labours when he brought out his *Ultimate* Glass—the result of his long years of research. The only genuine Crookes Ultimate is made by—

SIR WILLIAM CROOKES ULTIMATE ANTI-GLARE GLASS CO., LTD.,

30, WIGMORE STREET, LONDON, W.

REMEMBER THE SUFFIX—ULTIMATE.

GOLD FILLED & NICKEL GOODS

ALSO

UNCUT LENSES

AT ASTONISHINGLY LOW PRICES.

QUALITY AND FINISH GUARANTEED.

SEND FOR PRICE LIST.

OUR RX DEPARTMENT IS UNEQUALLED FOR PROMPTNESS & ACCURACY.

Telephone: HOLBORN 1628 (Private Exchange).

KIRK BROTHERS

WHOLESALE & MANUFACTURING OPTICIANS

Telegrams: KIRBROREX, HOLB. LONDON.

36, GRAY'S INN ROAD, LONDON, W.C. 1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Actual Manufacturers.

WILLIAM GOWLLAND, LTD.,

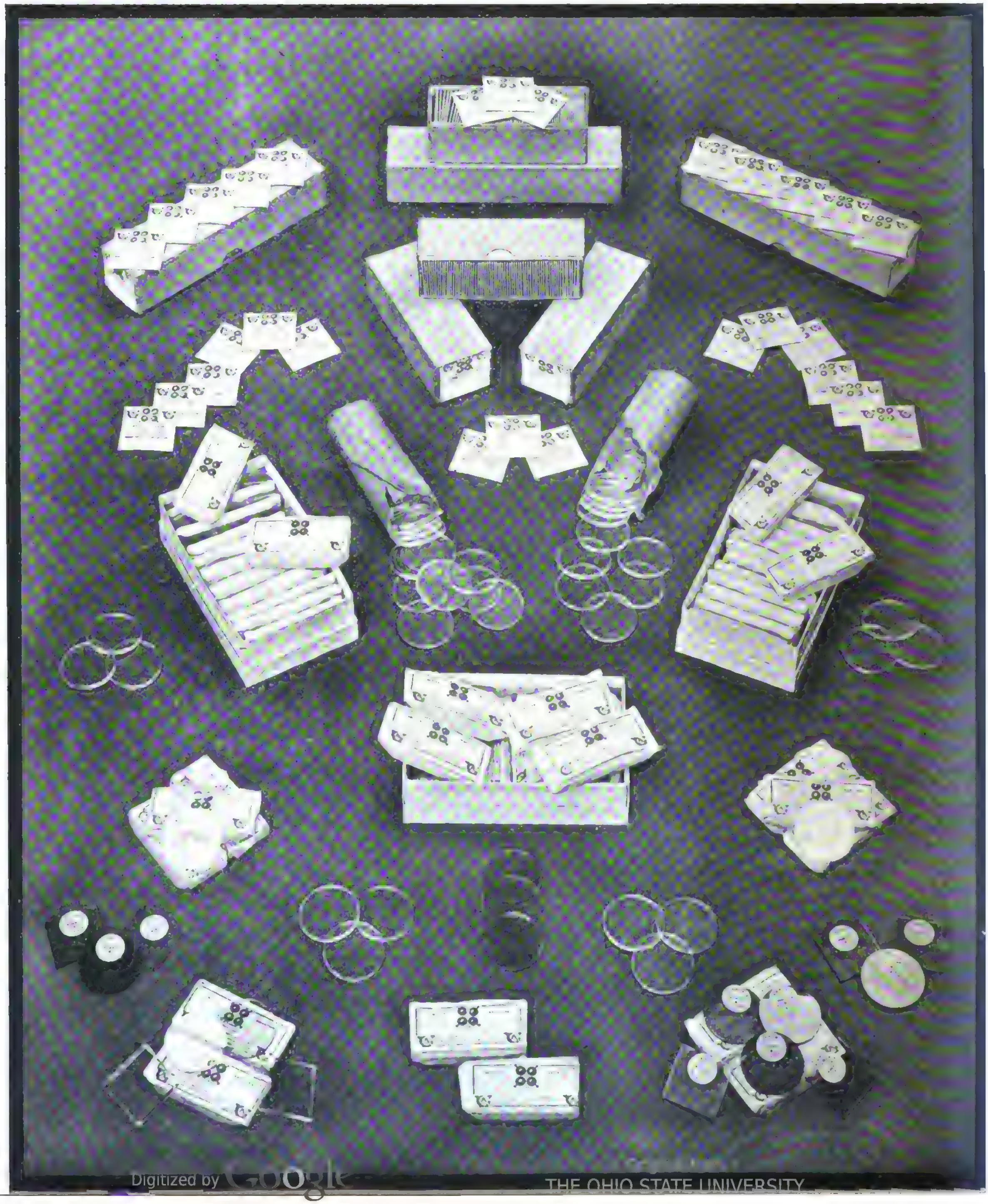
Price Lists on Application.

Telegraph: "Fundus, Croydon."

Optical Works, Morland Road, CROYDON, LONDON.

AND AT PARIS.

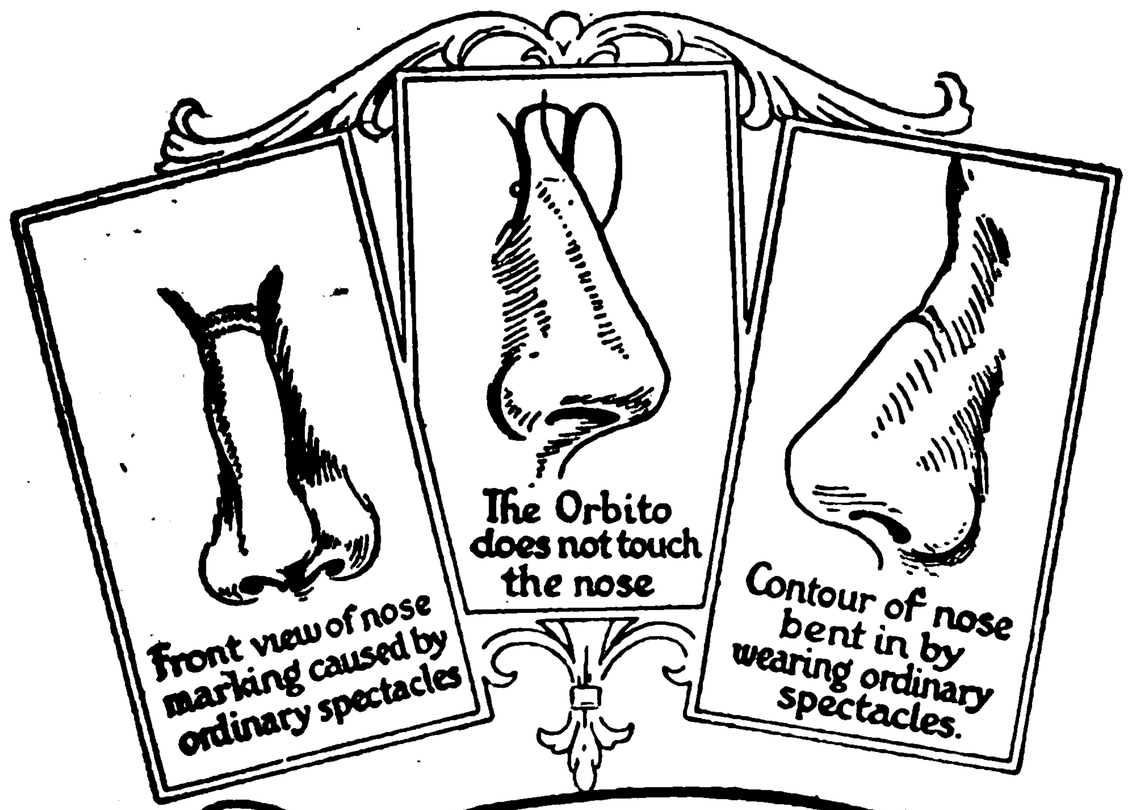
Telephone: 463 Croydon.



Digitized by Google

THE OHIO STATE UNIVERSITY

Have You Seen Samples of Our Latest Products?



Orbito

The ONLY non-pressure Glasses

BETTER THAN EVER.

Gold and Shell
Gold Filled and Sheltex
Gold Filled 1/10 12-ct.
Solid Nickel
Hand Made Steel

SPECTACLEWEAR THAT SELLS ITSELF.

SEND FOR SAMPLES AND BOOKLETS TO THE INVENTORS AND PATENTEES.

Special Window Display Sets Supplied FREE.

OPTICAL PRODUCTS Co.,
WORCESTER STREET, BIRMINGHAM.

Manufacturers of Gold & Rolled Gold Eyeglass Chains.

TELE Phone 778 Mid:
Grams ORBIMOUNT.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

THE SEYMOUR WHOLESALE OPTICAL CO.,

LENS FACTORS,

3 & 4, BARRETT ST., MANCHESTER SQUARE, LONDON, W.1

The bulk of our LENSES are of ENGLISH manufacture.
HIGHEST GRADE ONLY.

Should you be Prejudiced in Favour or Otherwise, let us submit you SAMPLES and PRICES.

In stock CROOKES—Sphs, Cyls, Meniscus, Rough, Torics, WHITE—Sphs, Meniscus, Cyls, (Rough and Finished ++− Base Torics.)

It is to Your Interest just now to Buy BRITISH GOODS.

Phone—MAYFAIR 851.

DIAMOND DRILLS—DIAMOND LENS CUTTERS

DIAMOND TURNING TOOLS, ETC.



Admitted by all who use them to be **THE BEST** For Drilling Glass, Lenses, &c.



At Lowest Prices.

ALL KINDS OF DIAMONDS FOR MECHANICAL PURPOSES.

F. SMITH, Opticians Drill Maker,

69, HATTON GARDEN, LONDON, E.C. 1

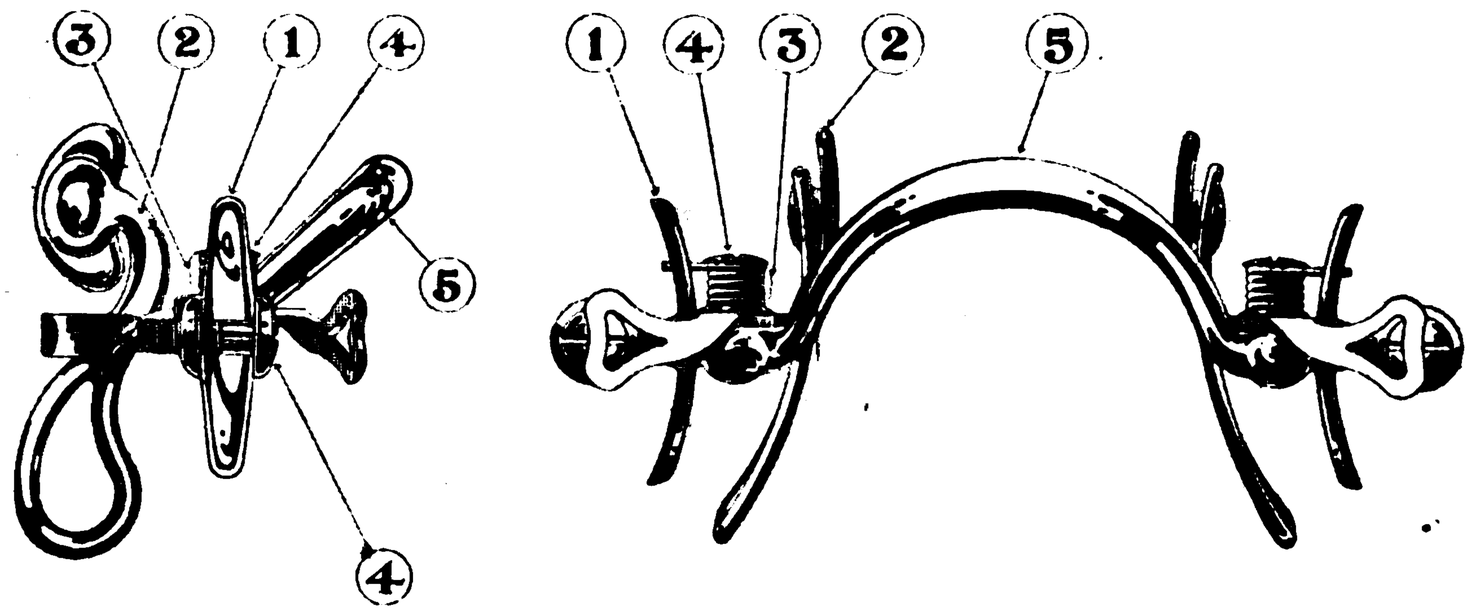
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

TENNYSON OPTICAL PRODUCTS.

BRITISH MANUFACTURE.

THE FIRST PRODUCTION.



THE "PRINCE" FINGERPIECE MOUNT.

This is, by common consent of leading optical authority, a finer production than any similar foreign article. In design it possesses points of distinct superiority, while in finish it conforms to the very highest standards, and is characteristic of British thoroughness in manufacture. You are an expert, consider its features indicated in the above enlarged diagram. This is a typical T.O.P. Line, and is designed upon a type which we feel represents the present trend of public choice.

ORDER THROUGH YOUR WHOLESALER.

THE "PRINCE" FITTING SET.

We shall be pleased to send you T.O.P. Illustrated Catalogue on application.

OPTICS Ltd.

TENNYSON WORKS,
WILLESDEN LANE,
LONDON, N.W.6.

WHOLESALE AND EXPORT ONLY

GUARANTEED BRITISH MANUFACTURE PRODUCTS

G

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

MARINE, FIELD, RACE & OPERA GLASSES.

BRITISH MADE BINOCULARS.

Extensive Range of Models to Suite every Requirement.

Don't send your Orders *abroad* we will give you as Good Value for money.

LIBERAL TRADE DISCOUNTS

Illustrated Catalogue on Application.

REPAIRS to every description of Binoculars.

Collection and delivery in London District *Daily*.

Send your enquiries to—

HOWARD OPTICAL WORKS,
SALISBURY ROAD, BARNET.

Contractor to the Admiralty, War Office & India Office.

S. C. HOWARD, 121, Salisbury Road, Barnet.
Telephone: BARNET 203.

WILLESDEN IS A BIG PLACE

There is more than one Optical house in Willesden but only one W.O.W.

We are not connected in any way with other Optical concerns in Willesden or elsewhere.

Keep W.O.W. distinct in your mind.

Think of quality and W.O.W. as synonymous terms—and you are right.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY:
DUDDEN HILL LANE, N.W.10

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,
DANDURAND BLDG., MONTREAL.
Cable "Optical" A.B.C. Code 5th. Edition.

RADIUM COMPOUND

SELF-LUMINOUS.

Highest Possible Efficiency, Durability and Value.

As supplied to H.M. Government, &c.
Guaranteed to pass N.P.L. requirements.
All Grades in stock, from 15/- per gram.
RADIUM SALTS TESTED AND CERTIFIED.

F. HARRISON GLEW THE RADIUM LABORATORY,
156, Clapham Road, London, S.W.9

Candidates for the Examination of the **Worshipful Company of Spectaclemakers** can always be certain of receiving the most thorough and painstaking preparation at

THE SCHOOL OF OPTICS, LTD.,

Under the direction of Mr. LIONEL LAURANCE (Official instructor to the Company) and Mr. H. OSCAR WOOD.

General Optics, Visual Optics and Sight Testing.

The percentage of successful students AT THE FIRST ATTEMPT is consistently high.

Correspondence Courses, Afternoon and Continuous Day Classes.

Particulars on application to —

2, GUILFORD PLACE, LONDON, W.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

TIME IS MONEY—and for the Retail Optician, quick service is an important factor in the Success of his Business.

AVOID VEXATIOUS DELAYS BY PLACING ORDERS WITH

LEVER BROS.

WE GUARANTEE YOUR PRESCRIPTION WORK IN 24 HOURS

This service includes Kryptoks when the Blanks are in stock; otherwise within 24 hours after receipt of blanks from the manufacturers.

COMPLETE STOCKS OF R.G. FRAMES AND FITTINGS AND UNCUT LENSES,

from which orders are filled by return of post.

SPECIAL LOW PRICES FOR HOSPITAL WORK.

Latest Price List for the foregoing, and Trade Stationery gladly sent on request.

LEVER BROS.

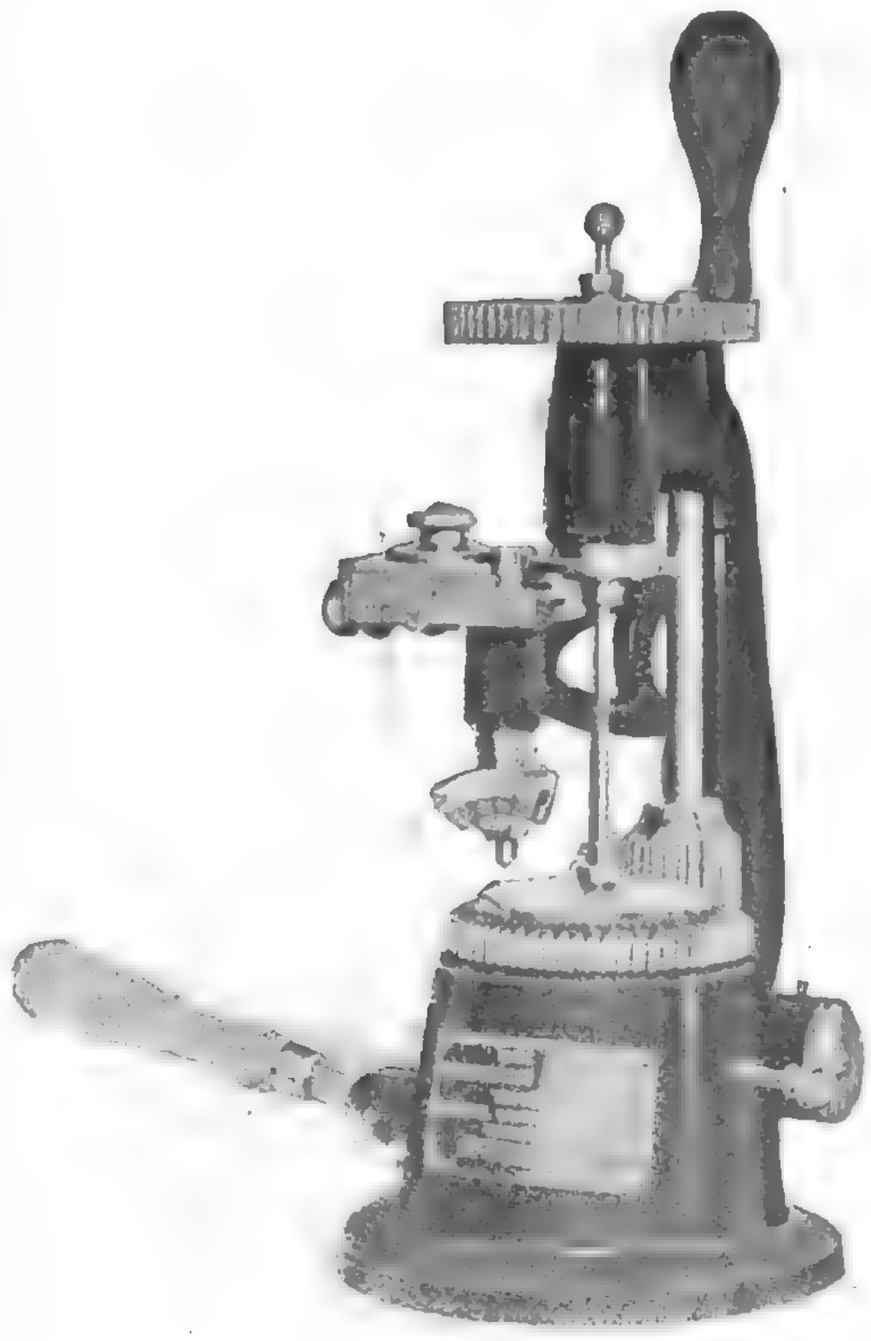
Wholesale Opticians & Manufacturers of Ophthalmic Ware,

18, HATTON GARDEN, E.C. 1

G2

Digitized by Google

Original from THE OHIO STATE UNIVERSITY



The

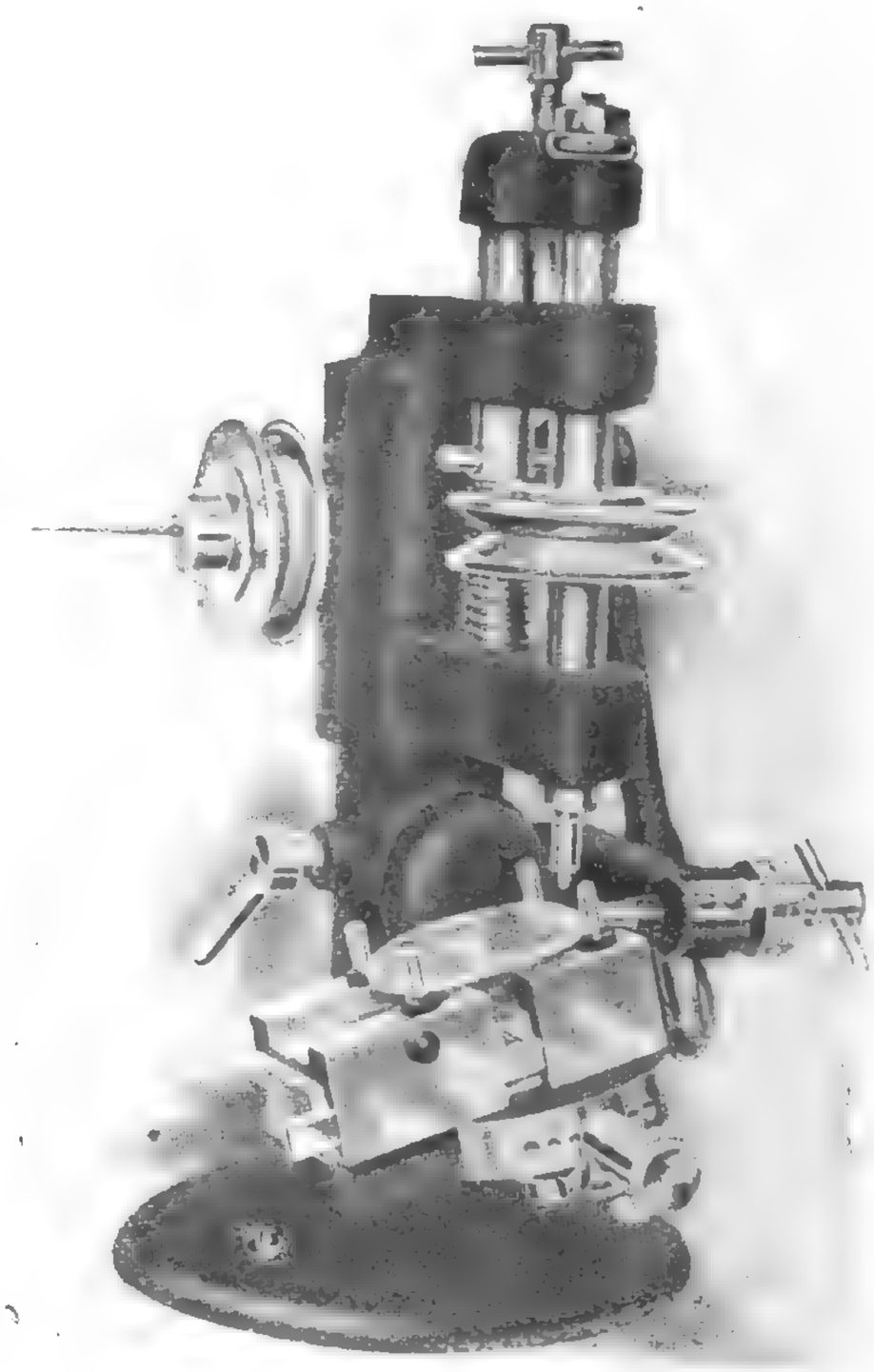
"Consol" Lens Cutter.

There are "Lens Cutters" and there is the "Consol" Lens Cutter and that's the difference.

The "Consol" has been built by Mechanics who know their work, and who have more than a fleeting knowledge of what a Lens Cutter has to do.

In consequence they have evolved a machine which for efficiency, simplicity, accuracy and strength, cannot be surpassed.

The tilting attachment supplied on a "Consol" Cutter is readily set to cut any lens, being made so that it permits setting at a perpendicular to the curve of Lens.



The

"Consol" Lens Drill.

The modern large Prescription Plants can only carry on by using the finest machines, and this "Consol" Drill is found in every up-to-date works. One testimonial says—"Your 'Consol' Lens Drill is a beauty, and the more I use it, the better I like it."

The "CONSOL" MACHINERY includes SENIOR and JUNIOR AUTOMATIC LENS EDGING MACHINES, COMPLETE OPTICAL WORK BENCHES, DRILLS, CUTTERS, SURFACERS and particulars of any class of our machines can be obtained from ANY WHOLESALE OPTICAL HOUSE, or from

THE GENERAL OPTICAL Co., (E. T. & F. W. Cornwell),

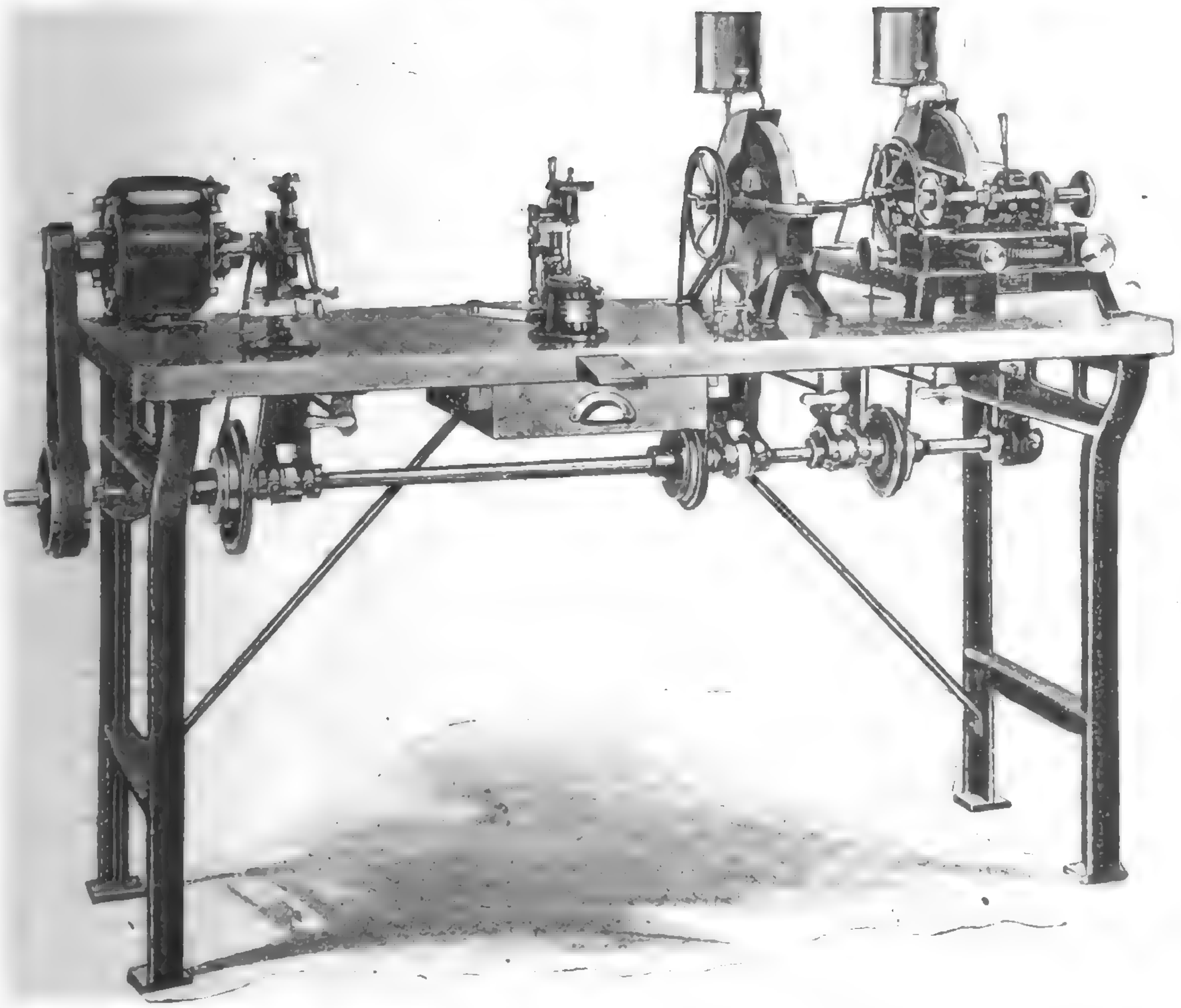
32, ELY PLACE, HOLBORN, LONDON, E.C.1

Who are the sole distributors of "CONSOL" Machinery Products.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"CONSOL" Nº 1C WORK BENCH.



This Optician's Work Bench comprises all that is necessary for edging and drilling Spectacle Lenses.

It consists of a "Junior" Rimless Automatic Edger, "Junior" Hand Stone for bevel edge work, "Consol" Drill and "Consol" Cutter. The Bench itself is stoutly built and is provided with screwing block and tool drawer. The bench can be driven by a ½ h.p. motor. Space required 60" x 21". This is the ideal Edging outfit for the Retail Optician and makes a splendid addition to any Optical Workshop.

Full particulars of this and all other "CONSOL" Machinery can be obtained from your usual Wholesale Optical House or from

THE GENERAL OPTICAL Co. (E. T. & F. W. Cornwell),

32, ELY PLACE, HOLBORN, LONDON, E.C.

Who are the sole distributors of "Consol" Machinery Products.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is 3d. per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

FOR SALE, Automatic rimless edger, cheap, wheel 17" x 2". Box 3492, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, trial case. State condition and price. Box 3493, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, trial case, modern, reasonable. 30, Branksome Road, Merton Park, S.W.19.

WANTED an Analytical and Precision Balance, to weigh up to 200 grammes and sensitive to 1/10 milligramme, together with set of weights. State price to Birmingham and Midland Motor Omnibus Co., Ltd., Bearwood Road, Smethwick, Staffs.

AUSTRALIAN OPALS. Direct from Australia. Single stones or quantities. Beautiful colours. Lists free. Optical goods or scientific instruments in exchange. Correspondence invited. Seward, Optician, Melbourne, Australia.

FOR SALE. Fine 4-prism Browning Spectrometer in perfect condition. Complete with three eye-pieces, and all accessories. Can be inspected in London by appointment. Reply, Box 3486, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

OPTICAL business for sale, just outside London. Established two years, selling owing to other interests. Apply, Box 3494, c/o "The Optician," 125, Fleet Street, E.C.4.

SIGHT-TESTING Business, important town, East Grinstead. Big turnover, bargain. Box 3495, c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 18*

REQUIRED by energetic man, 28, position as manager or first assistant, 10 years' experience. Good salesman. Capable refractionist, disengaged. Box 5711, c/o "The Optician, 125, Fleet Street, E.C.4.

WANTED thoroughly competent male assistant for wholesale optical warehouse. Previous experience in the trade essential. Particulars with age and salary required to Box 5720, c/o "The Optician," 125, Fleet Street, E.C.4.

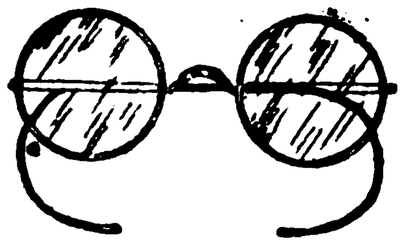
RETAILERS who appreciate
PERFECT RIMLESS FITTING,
no loose screws—exact Measurements
Send to:
ROWLEY & Co.,
Deansgate, Manchester.

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A. — **C. O. DYMOND,** M.I.Mech.E., F.I.C.P.A
W. P. THOMPSON & CO.,
12, CHURCH STREET, LIVERPOOL.
Chartered Patent Agents.
H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A. — **J. V. ARMSTRONG,** M.T.I., F.I.C.P.A.

ARTIFICIAL EYES.

The British market is now flooded with continental Eyes which frequently crack and go discoloured after being worn a short time.
If you would avoid this, buy direct from the actual maker, who guarantees every eye supplied to be made in their own works, from British Materials.

ALBERT E. WATERS,
Empire Works,
Mole Street, Sparkbrook, Birmingham.



OPTICAL BLOCKS
To illustrate all features of Optical Service. Write for Lists.
CHEMISTS' DESIGN SERVICE,
12, Humberstone Gate, LEICESTER.

C. BAKER 244 HIGH HOLBORN LONDON
Estab. 1765
Do You Handle Kodaks?
The "Metron" Plate Adapters, if stocked, will mean a large Increase of Business.
PARTICULARS AND TERMS ON APPLICATION

THE "LEA VALLEY" DRILLING MACHINES
FOR INSTRUMENT MAKERS AND OPTICIANS.
British Design and Workmanship.
Fitted with Goodman's Detachable Swivelling Table, (provisionally protected) for horizontal, vertical and angular drilling. Described as "A practically useful feature with obvious advantages." Particulars on request.
Agents wanted in all Parts of the World.
F. GOODMAN, 4, Chatsworth Road, Luton.

KINGSWAY OPTICAL WORKS.
E. ARNELL,
34 Old Gloucester Street, Queen's Square, London.
The Hospital for Repairs of Spectacles, Eyeglasses, Rimless Work, Glazing, etc. Sph. Lenses, sph. cyls. and torics in stock.

PERCY S. DE SAULLES.
Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES.
Micro Cover Glasses, Glass Cells and Cavity Slips, etc.
The Platts, Amblecote, Stourbridge.

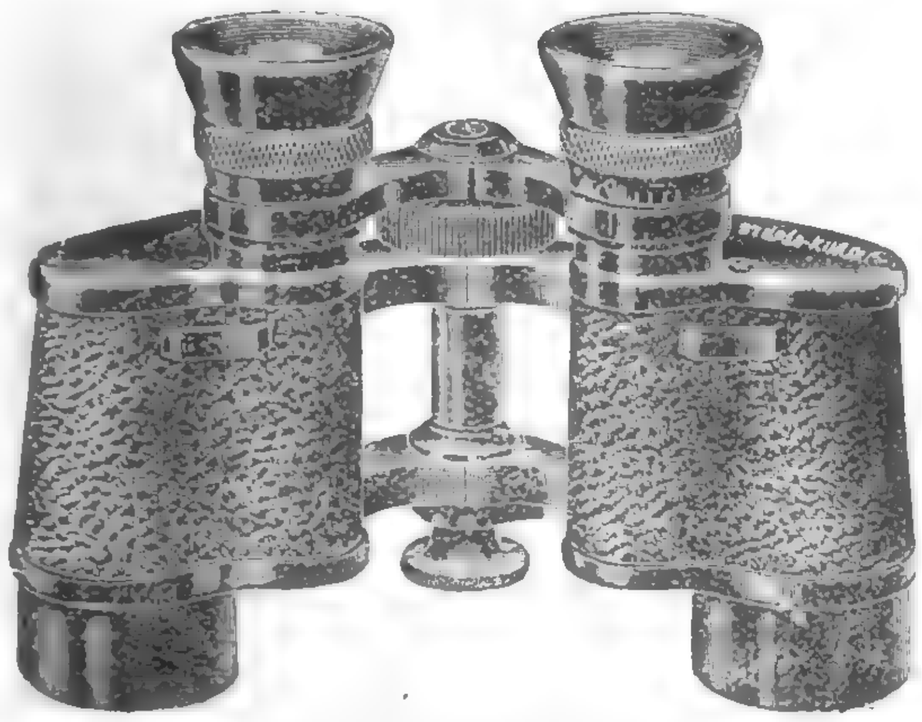
DIXON & HEMPENSTALL,
Wholesale and Manufacturing Opticians,
12, SUFFOLK STREET, DUBLIN.
Telegrams "Optics, Dublin."

Digitized by Google — Original from THE OHIO STATE UNIVERSITY

BINOCULARS

BEST AND ORDINARY MAKES.

Stereo Prism Binoculars for Sports, Touring, Aviation, Naval & Military Purposes.

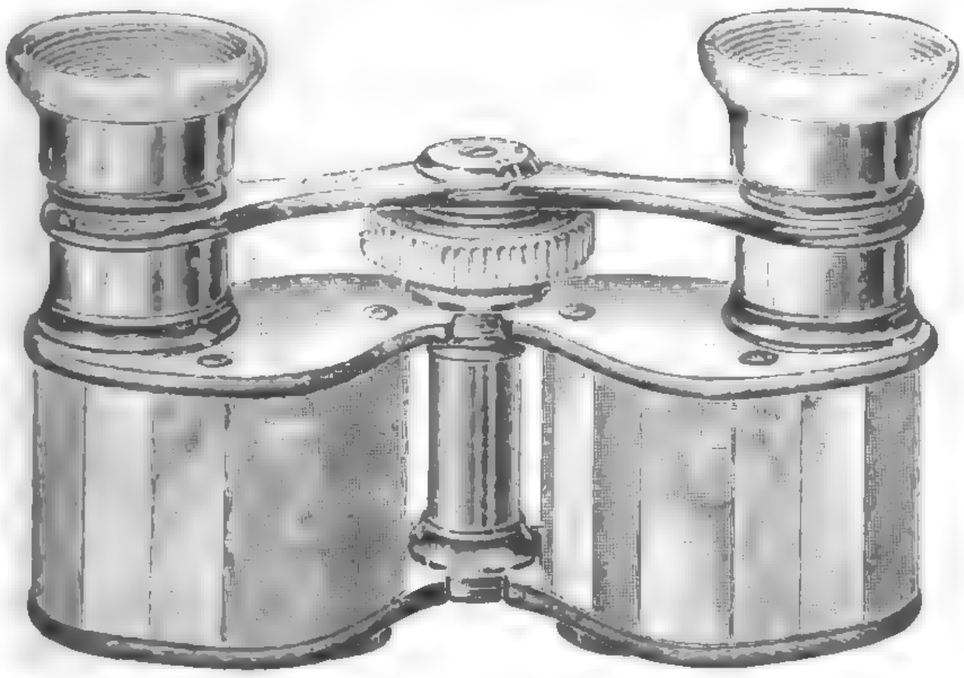


Magnification x 6 x 8
also x 10 x 12 and x 16



THE BIJOU—*Half Actual Size.*
Magnification x 6 Objectives 16 m/m.
Very Light, Small and Elegant. Especially suitable for Ladies.

THEATRE PRISM BINOCULARS.



Magnification x 3½ Objectives 15 m/m.

GALILEAN BINOCULARS.



Magnification x 5 x 5½ x 5½ x 6
Lines 19 21 24 26
Types for all outdoor purposes, also Theatres.

TELESCOPES—Portable double prism Telescopes—Diameter of objective 80 m/m—Magnifications 15—23—30 times. These high-class instruments are fitted with three eye-pieces on a rotating eye-piece head. Also cheap Telescopes for Sports, three—four draw.

MICROSCOPES—for Students—Readers' Magnifiers—Linen Testers.

We hold stocks in England of the above and many other varieties ready for immediate delivery.

STRICTLY WHOLESALE ONLY.

L. LePersonne & Co., Optical Dept.

ESTABLISHED 1888

Merchants, Agents and Brokers,

99, CANNON STREET, LONDON, E.C. 4

Telegraphic Address: "Le Personne Cannon London."
Cable Address: "Le Personne London."

Telepeone Nos. BANK 5144 and 5145 CENTRAL 2028 and 3 Private Lines.

Codes used: A.B.C. (5th Edition), Lieber's, Agar's, Western Union, Moreing & Neal's, Marconi, Premier, Bentley's Private.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

***A*.—Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

COMPETENT and Experienced refractionist wanted for small branch. Good business abilities and gentlemanly disposition essential. Bradford, 161, High Road, Kilburn, N.W.6.

EMPLOYER can recommend a thoroughly reliable and qualified manager, for a similar position. App'y, Box 5719, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., D.B.O.A. (21), seeks re-engagement in London district. Box 5718, c/o "The Optician," 125, Fleet Street, E.C.4.

MESSRS. HAGON, LTD., Chemists and Opticians, 5, Bute Street, Cardiff, require an assistant (man) for the sight-testing department. Must be competent. Working class business, age 30 or above.

WANTED for India by Walter Bushnell, Ltd. A young single man, B.O.A. or S.M.C. State age, experience and fullest details re experience, character, etc., in strict confidence to Box 5717, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED All-round worker, rimless fitting essential, good opportunity. Write stating experience and salary required. C. Winston, 32, Kirkgate, Bradford.

FIRST-CLASS All-round gold worker requires situation, used to taking charge. Town, country or abroad. Apply, Box 5716, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., 24, requires change, as sight-testing assistant or branch manager. London district preferred. Apply, Box 5715, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED Refractionist, 25, neutralising, transposing, cutting, drilling, rimless fitting, and all jobbing. 8 years' experience. Studying for S.M.C. F. Holt, 20, Lannoy Road, New Eltham, S.E.9.

LADY, Qualified, D.B.O.A., slight knowledge of retinoscopy, seeks engagement in London. Box 5714, c/o "The Optician, 125, Fleet Street, E.C.4.

D.B.O.A. passed part F.B.O.A., competent and careful tester, requires post in London or Midlands. Three years' experience. Age 20. Lidiard, 33, Chalk Hill, Watford.

FIRST-CLASS refractionist and salesman wanted by old-established business. Yorkshire city. Send full particulars, experience, salary wanted, etc. Box 5713, c/o "The Optician, 125, Fleet Street, E.C.4.

QUALIFIED Branch Manager, good prominent position to right man. Give full particulars, salary required, photo if possible. Lancashire town. Box 5712, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN recently qualified desires berth where opportunity for advancement and good experience can be gained. Must be in or near London or Glasgow. Box 5708, c/o "The Optician," 125, Fleet Street, E.C.4.

APPRENTICESHIP wanted with good firm to learn all round gold spectacle making (leaving school). Scrivener, 4, College Street, Islington, N.1.

SECOND Year student Northampton Institute requires position with sight-testing or wholesale opticians. Sound knowledge of all Rx work, machine and hand edging, slight knowledge of single surfacing. Box 5696, c/o "The Optician," 125, Fleet Street, E.C.4.

RETAIL Assistant, 15 years' experience, highest credentials, would like to travel in Ireland for wholesale firm. What offers to Box 5703, c/o "The Optician," 125, Fleet Street, E.C.4.

A "FIRST" Assistant, 10 years' optical experience with eminent houses, desires change. Fully competent in sight-testing, fitting and all workshop jobbing. Also thoroughly conversant with photographic department. Moderate salary, Box 5701, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACER, 24, seeks position London or suburbs. Thorough experience in kryptoks, segments, etc. Apply, T.D., 251, East India Dock Road, E.14.

ASSISTANT, 19, seeks situation with optician, nearly two years' experience, familiar with prescription work. Studying for F.S.M.C. City preferred. P.V.T., 292, Lancaster Road, Kensington, W.11.

RELIABLE Sight-tester qualified seeks berth as first assistant or manager, workshop experience. Box 5709, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. desires morning work. Experienced tester, good salesman. Would consider attending jewellers or chemist to start sight-testing side, own equipment if necessary. Box 5706, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT required temporarily, Midlands. Particulars of sight-testing experience, age and salary to Box 5707, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN, 23, keen, D.B.O.A., retail experience, seeks position as representative of wholesale firm. Willing to go abroad. Box 5705, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED Refractionist, retinoscopist, etc., seeks change, good personality, long sight-testing experience. Reply, J.H., 58, Hugh Gardens, Benwell, Newcastle-on-Tyne.

EXPERIENCED Refractionist, competent at repairs, edging, glazing rimless, bifocal and shell work, used to management, desires change. Excellent credentials. Box 5704, c/o "The Optician," 125, Fleet Street, E.C.4.

SHELL Spectacle and lorgnette maker, good repairer. Write, S. Clarke, 37, Millais Road, Leystonstone, E.11.

SITUATION wanted with retail London optician by young lady assistant, smart saleswoman, can neutralise and do repairs. 5 years' reference. Knowledge of shorthand and typing. Miss Sellwood, 36, Talbot Road, West Ealing, W.

REFRACTIONIST seeks position as manager or assistant, 17 years' experience, thoroughly practical and reliable, energetic, tall, age 33, good appearance, reference present employer. "Ophthalmic," 63, Broad Street, Bristol.

WANTED, all-round worker, rimless fitting essential. Good opportunity. Male or female. Write stating experience and salary required. References. The Clyde Optical Works, 80, Great Clyde Street, Glasgow.

SCIENTIFIC and Mechanical engineer requires situation, home or abroad. Thoroughly experienced in all optical instruments and machines. Capable draughtsman designer. Box 5692, c/o "The Optician," 125, Fleet Street, E.C.4.

GLASS Blower seeks situation, good references. F. O., 3, Sidmouth Street, Gray's Inn Road, W.C.

YOUNG MAN, 21, 6½ years' retail experience would like to take up wholesale work. Willing to commence at small salary. Apply, Allen, 7, Dunford Road, Holloway, N.7.

GIRL required for looking out prescription work, marking off, and checking for wholesale house in London. Permanent. Apply Box Office, No. 5710, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST (30), with 10 years' City experience, desires change, Manchester district preferred. Box 5693, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED Assistant wishes position with Midland firm. Box 5698, c/o "The Optician," 125, Fleet Street, E.C.4.

Concluded on page 16.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Bi-Liptic Reg^d.

Bi-focal Ophthalmic LENSES

A one piece Solid Bi-focal LENS
manufactured under License by the

UNITED KINGDOM OPTICAL Co., Ltd.,
MILL HILL, LONDON, N.W.7

A sample Bi-Liptic Reg^d. Lens, together with a descriptive booklet and prices may be obtained *on approval through your regular Wholesale House.*

To .....

Please send sample "Bi-Liptic" Bi-focal Lens, etc., as advertised by the United Kingdom Optical Co., Ltd., Mill Hill, London, N.W.7

Name .....

Address .....

.....

Cut this out and send to your regular supply house, it will interest you

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE OPTICIAN
Reg. at G.P.O. as a Newspaper

AMERICAN·OPTICAL·COMPANY, LIMITED.



Imagine assembling a fingerpiece mounting with your fingers, absolutely without fuss or annoyance. That's what you can do with the Bilt-in Bearings FITS-U.

Bilt-in Bearings assemble automatically and align positively without delicate adjustments. The two telescoping tubes turn the trick which is accomplished in a jiffy.

The beauty of Bilt-In Bearings lies in the simplicity. They are simplest where ordinary mountings are most complicated. And are strongest where other constructions are weakest. Bilt-In Bearings always work on their broad bearing surfaces without binding or strain. Friction is reduced to a negligible quantity.
These are stocked in solid Gold; 1/10th 12 ct. Gold-filled and Alumnico (high grade of white metal)

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C. 4. Printed by The Century Press, Fulham. Oct. 28, 1921.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT-MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1597 FRIDAY, NOV. 4, 1921.

Wellsworth M21 Bench Surfacing Machines.

Can be supplied with Automatic Polishing Attachments. Immediate delivery can be made from stock of Machines without benches.



WELLSWORTH

TRADE MARK (Reg'd.)

OPTICAL PRODUCTS.

AMERICAN OPTICAL COMPANY, LIMITED,

39, Hatton Garden, LONDON, E.C.1

Reg'd at the G.P.O. as a newspaper PRICE 4d *Subscription post free 12 months 17s*

Postage in United Kingdom 1d

Foreign Subscription including "Optical Magazine," post free 20s. *yearly.* *The Offices are at 1, Fleet St., London.*

Digitized by Google Original from THE OHIO STATE UNIVERSITY

GEORGE CULVER LTD

Manufacturing Opticians,

JOBBING AND PRESCRIPTION WORK

ACCURACY,

NEATNESS,

PROMPTNESS

Large and full stocks of English made Lenses of all combinations. Orders can be executed promptly.

OPTICAL WORKS:
WHITE LION STREET,
PENTONVILLE,
LONDON, N. 1

TELEPHONE:
NORTH 369 and 871

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

W.H.T.

GOLD
AND
G.F.

ASTIGS.
SPECS.
MOUNTINGS.
LORGNETTES.

and Ophthalmic Supplies of every description. Quotations and Samples from our comprehensive range on application.

Prescription Work Accurately and Promptly Executed.

WALTER H. THOMPSON
66 HATTON GARDEN, LONDON, E.C. 1.
Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



TRIAL CASES.

We have a large variety of trial cases in stock for immediate delivery.

Particulars on Application.

J. & R. FLEMING LTD.,

Telephone :
HOLBORN {814 / 815
HOLBORN {2788 / 2789} Prescription Dept.

136-148 Clerkenwell Road,

LONDON, E.C. 1.

Telegrams :
"OTTICO." LONDON.

Branches with Prescription equipment :

WALTER BRAHAM & Co. Ltd.
6, Key Hill Drive,
BIRMINGHAM.
Phone: Central 2509
Telegrams: "Brahma."

37, WESTGATE STREET,
CARDIFF.
Phone: Cardiff 44
Telegrams: "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1085.
Telegrams: "Ottico."

8, SHUDEHILL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
The Rt. Hon. VISCOUNT HILL, L.C.C.

Upper Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Renter Warden
HARRY HYLTON-FOSTER. Esq., Past Master.

Director of Examinations
The Rt. Hon. SIR WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in May, 1922.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,597

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, NOV. 4, 1921.

Last Week's Issue.—Our publishers request an apology to those subscribers who received their copies of last week's *Optician* late. The cause will be recognised by most, no doubt—that we had to produce not only a double number but a considerably increased supply of copies to cover the ground apart from our regular susbcribers. This would not matter if the mechanical arrangements for producing a weekly newspaper were the same as those used in the office of a daily. They are quite different, of course. Our printing is done by successive sheets; and until the last of these is being machined we cannot bind a single copy. Some advertisers delay their MS. unduly, which is a source of additional trouble, and has for them the disadvantage that we cannot submit proofs; but trade advertising is the most essential thing in the make-up of a trade paper, not only from the publishers' standpoint but from that of every reader of the journal. Last week's Special Issue of *The Optician and Scientific Instrument Maker* is a compend of information as to those manufacturers and distributors of optical goods who are in a position and desirous at this time, to extend their

Digitized by Google Original from THE OHIO STATE UNIVERSITY

transactions through the British wholesale market.

* * *

The Spectaclemakers Company.—The fifty-first examination of the Spectaclemakers Company was held this week, at St. Bride's Institute, E.C., and the City of London School. Opening the examination, by addressing his good wishes to the candidates, the Rt. Hon. Viscount Hill, L.C.C., Master of the Company, reminded them that the first examination was held in 1898. The questions to which they were about to address themselves, dealing with general and practical optics, were written by Dr. Drysdale, D.Sc., a leading authority in optical science and at present Superintendent of the Admiralty Research Department at the National Physical Laboratory. The Company's examiners, being experts in the subjects with which they deal, Lord Hill mentioned that the Court relied on them entirely, and the examiners' decisions were absolutely final and irrevocable. It would give every confidence to the candidates to know that their papers would be judged by fully competent authorities, and solely on their individual merits. He said he trusted they would all meet with success in their efforts to gain the Diploma in Sight-Testing, answering the questions clearly and intelligently, and win like success in the exercise of their calling. The Diploma was well worth winning, for it was now widely known, valued and accepted throughout our possessions. Dr. Drysdale also briefly addressed the candidates—who included thirteen ladies.

* * *

Thermometer Sales.—Some complaints are made as to the official meteorologists having apparently failed to anticipate the floods on the East Coast on Tuesday afternoon last, although data were available from which the occurrence might have been foretold with some probability. Let it be noted, however, that the forecast published daily in the newspapers, based on Meteorological Office reports, has attained a general accuracy much in advance of the forecasts of pre-war days. The expectation of rain, is what is of most concern to a majority of people; and of course, the prophecies in this direction are checked perfectly by common observation. Also common observation serves nearly enough in relation to the wind velocities foretold. With temperature, it is otherwise. Comparatively few people are practised enough in observations with the thermometer to be able to guess fairly well at the prevailing temperature of the air. Yet the prospect of atmospheric temperature levels during the day is as important as any other factor in the meteorological outlook. People who keep themselves informed each morning on the often quite accurate prognostications of temperature changes, need to cultivate such a knowledge of the thermometer as will be a safe guide to interpreting the Meteorological Office figures. But how many of our customers are able to make a close estimate of the thermometric degrees corresponding to various "sensations" of temperature, indoors and outdoors? Admittedly, the hygrometric state of the air is a complicating element here; but the degree of heat is much more vital. For an educational purpose in this sense, good thermometers should be used by every householder, one out-of-doors and as many indoors as there are dwelling rooms. This indicates a good selling point; and the remark, we think, suggests the basis for a good selling talk, to opticians who deal in those most valuable instruments, thermometers.

Smoking and Eyesight.

Many women are suffering from a slight but annoying malady of the eyes, and those who smoke are inclined to blame cigarettes. "I cannot say that I have dealt with any cases of eye trouble due to smoking," said a Harley Street oculist to a 'Daily Express' representative. "Smoky atmosphere is bad for eyes, and where only a few people smoke the air soon becomes distressing to sensitive subjects. The chief drawback to smoking for women, in my opinion, is that it affects the voice and throat. It is true that one or two great singers are heavy smokers, but there are exceptions to every rule. Purity of the voice is a great charm, and it is possible that if women continue to be inveterate smokers much of this charm will be diminished, and their singing capacity be less. We all know how women are given to scamping their meals, and then immediately smoke a cigarette. Tobacco is not meant to complete, or take the place of a meal. It becomes an enemy when treated in this fashion."

At the next meeting of the Optical Society at the Imperial College, 7.30 p.m., on Thursday, the 10th inst., the following papers will be presented:—"The Path of Rays in Periscopes having an Inverting System comprising two Separated Lenses," by Dr. Alexander Gleichen (communicated by Dr. James W. French), "The Interocular Distance," by Dr. James W. French, "Note on the Thin Astigmatic Lens," by Mr. T. Chaundy, M.A.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

AN OPTICAL NOMOGRAM.

By J. A. TOMKINS, A.R.C.S. (Lond.), F. Inst. P., Technical College, Bradford.

(2) Figs. 10 and 11 illustrate the case of a *Pair of Equal Negative Lenses.* Here it will be seen that f_v, h and f are each negative for all values of d; that while f_v and h gradually increase, f gradually decreases; that the principal planes are in all cases between the lenses and are not crossed as with positive lenses.

(3) Figs. 12 and 13 show separately, for the sake of clearness, the two cases of the *Unofocal Photographic Lens* consisting of two lenses of equal focal lengths but of opposite

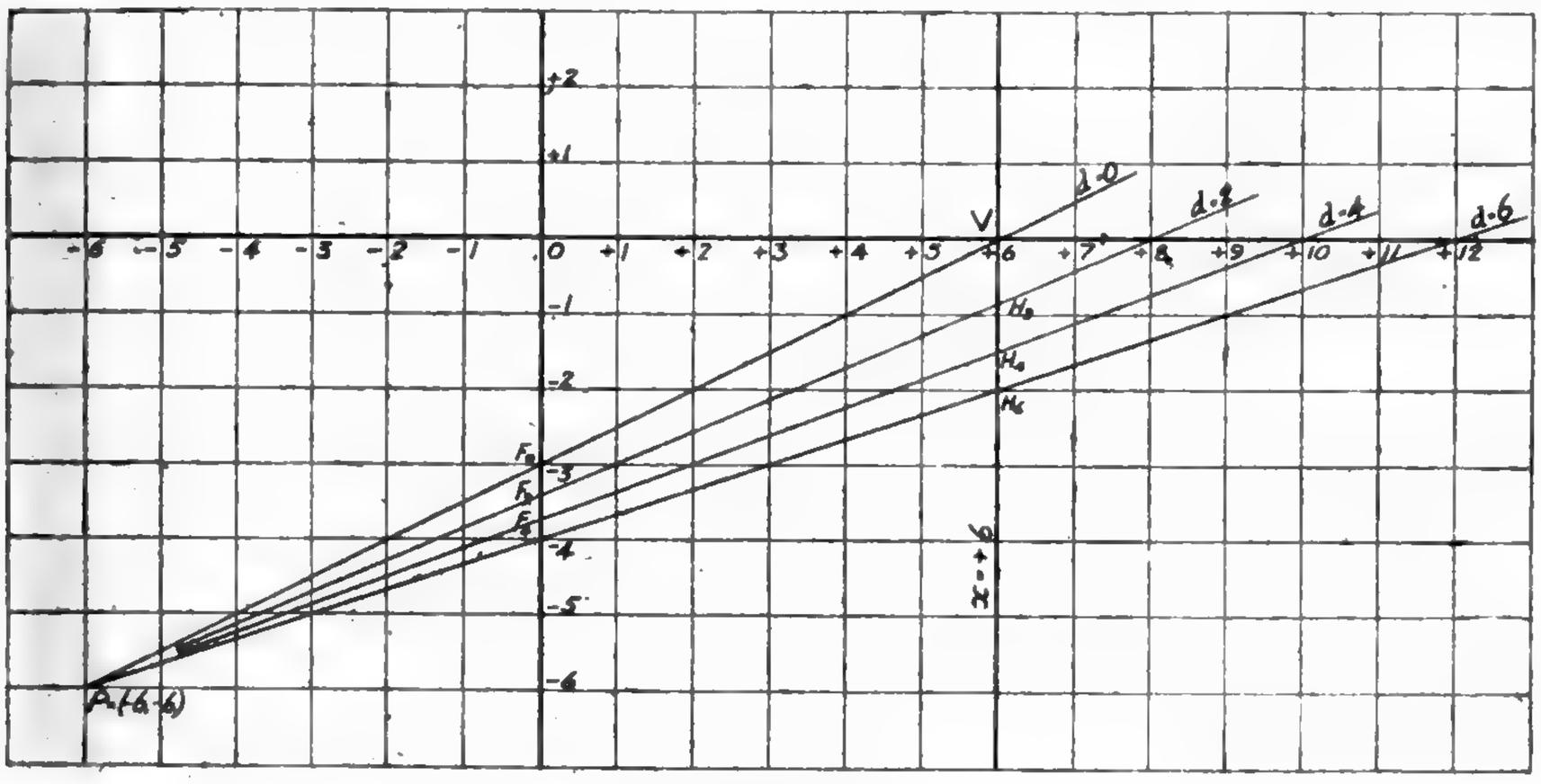
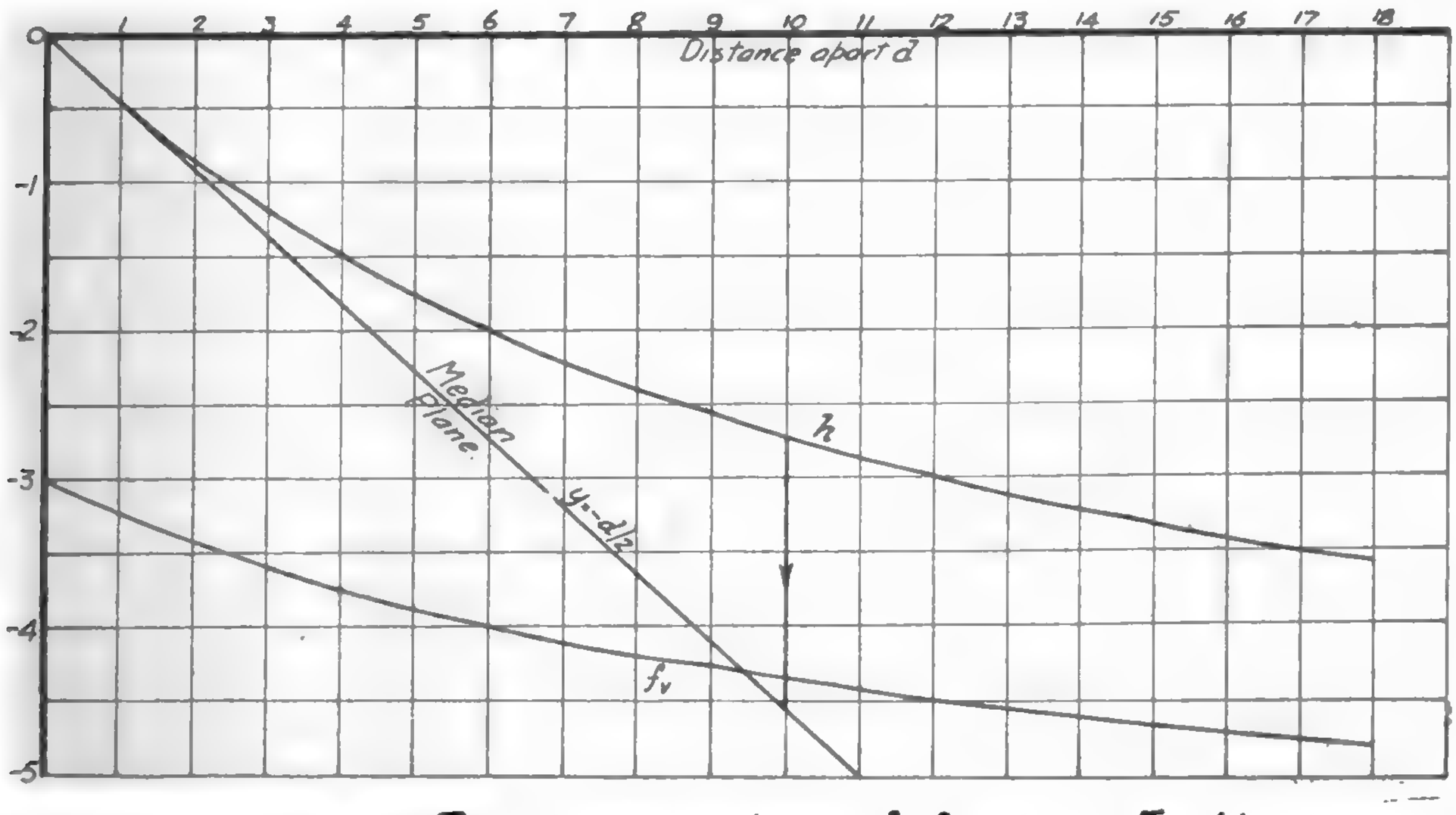


Fig. 10

Pair of Negative Lenses. $f_1 = f_2 = -6$.



Pair of Negative Lenses $f_1 = f_2 = -6$ Fig. 11.

*Concluded from page 145.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

sign, viz., +6 and −6 respectively. It will be seen that, since P lies on the line $y = -f_1$, the points H_1, H_2, H_3, etc. for various values

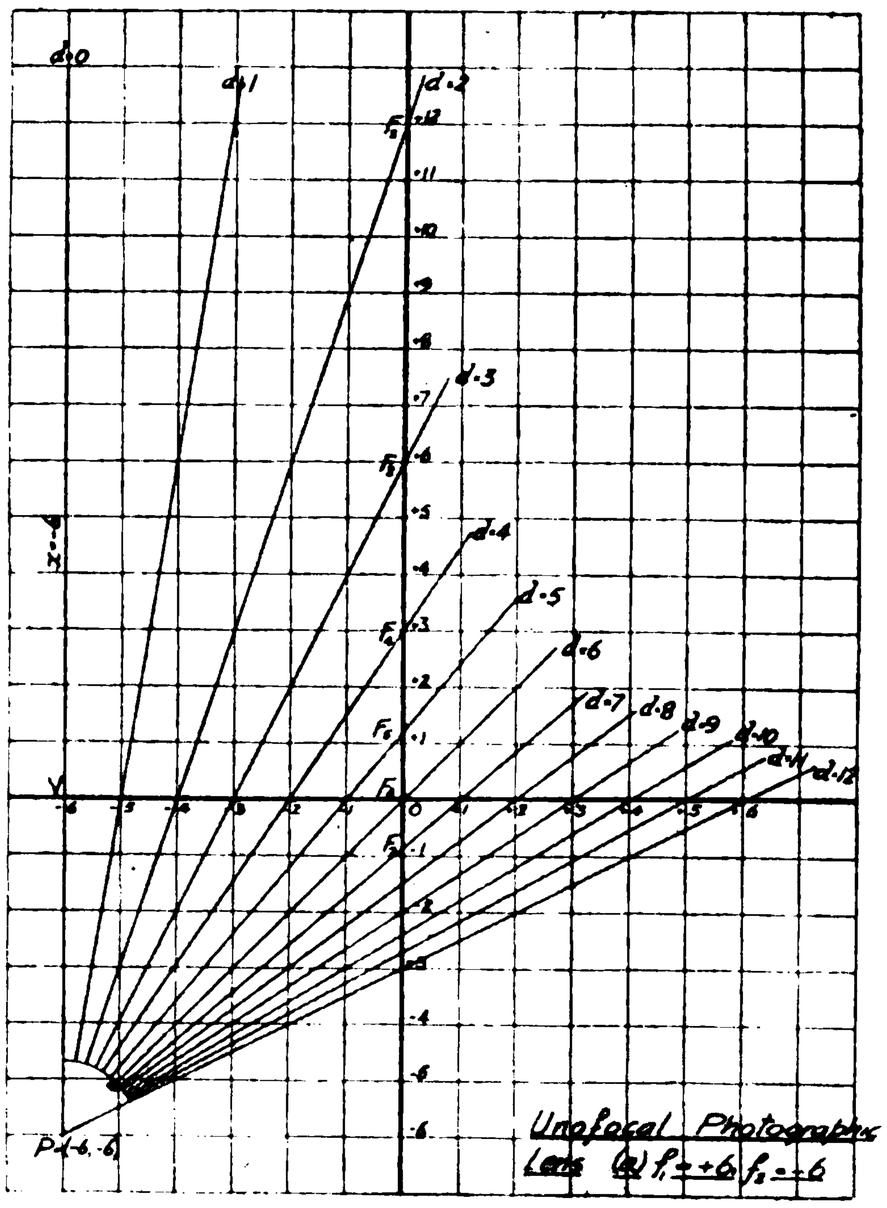


Fig 12.

of d all coincide with P. Hence VH is constant and equal to +6, and −6 respectively.

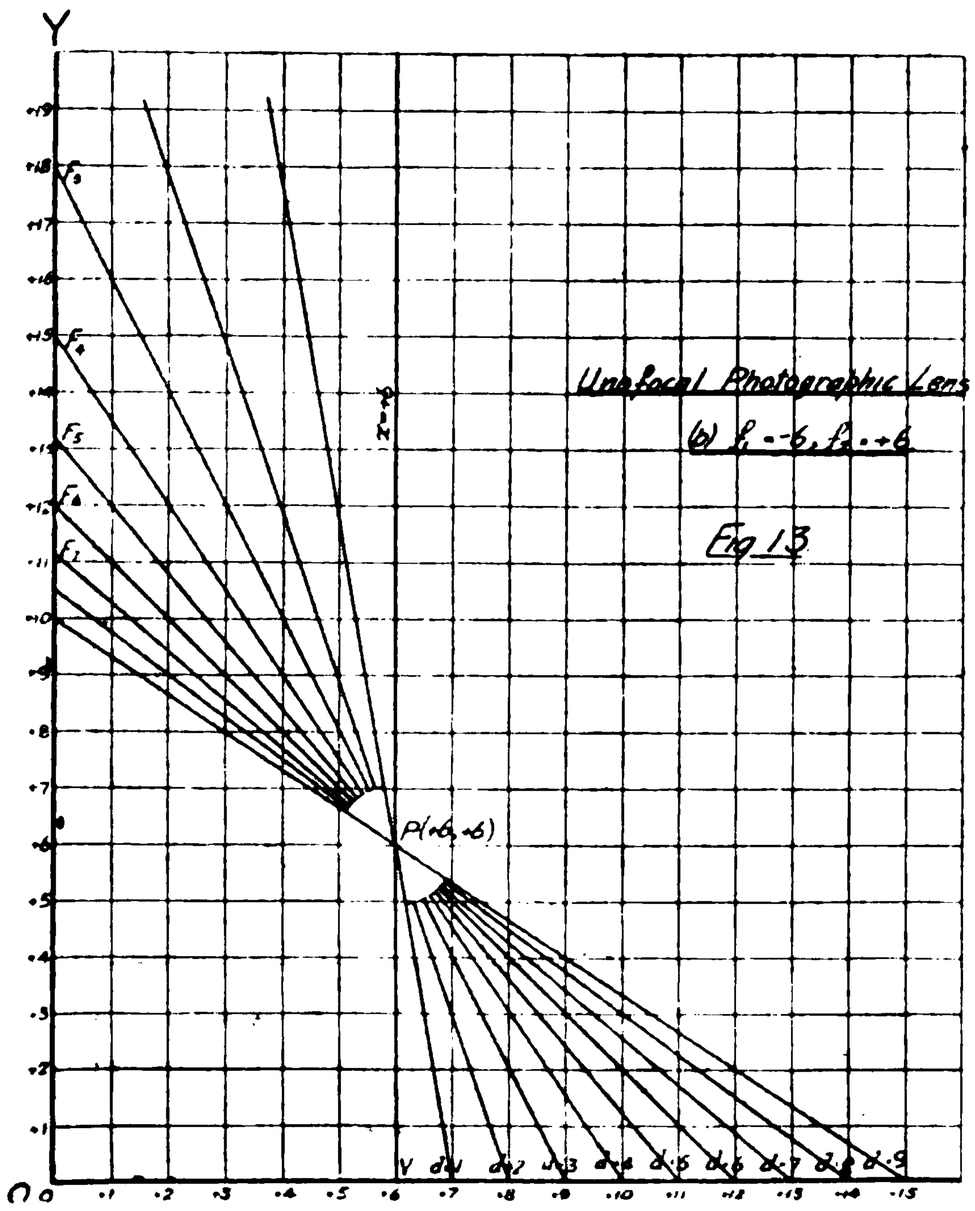
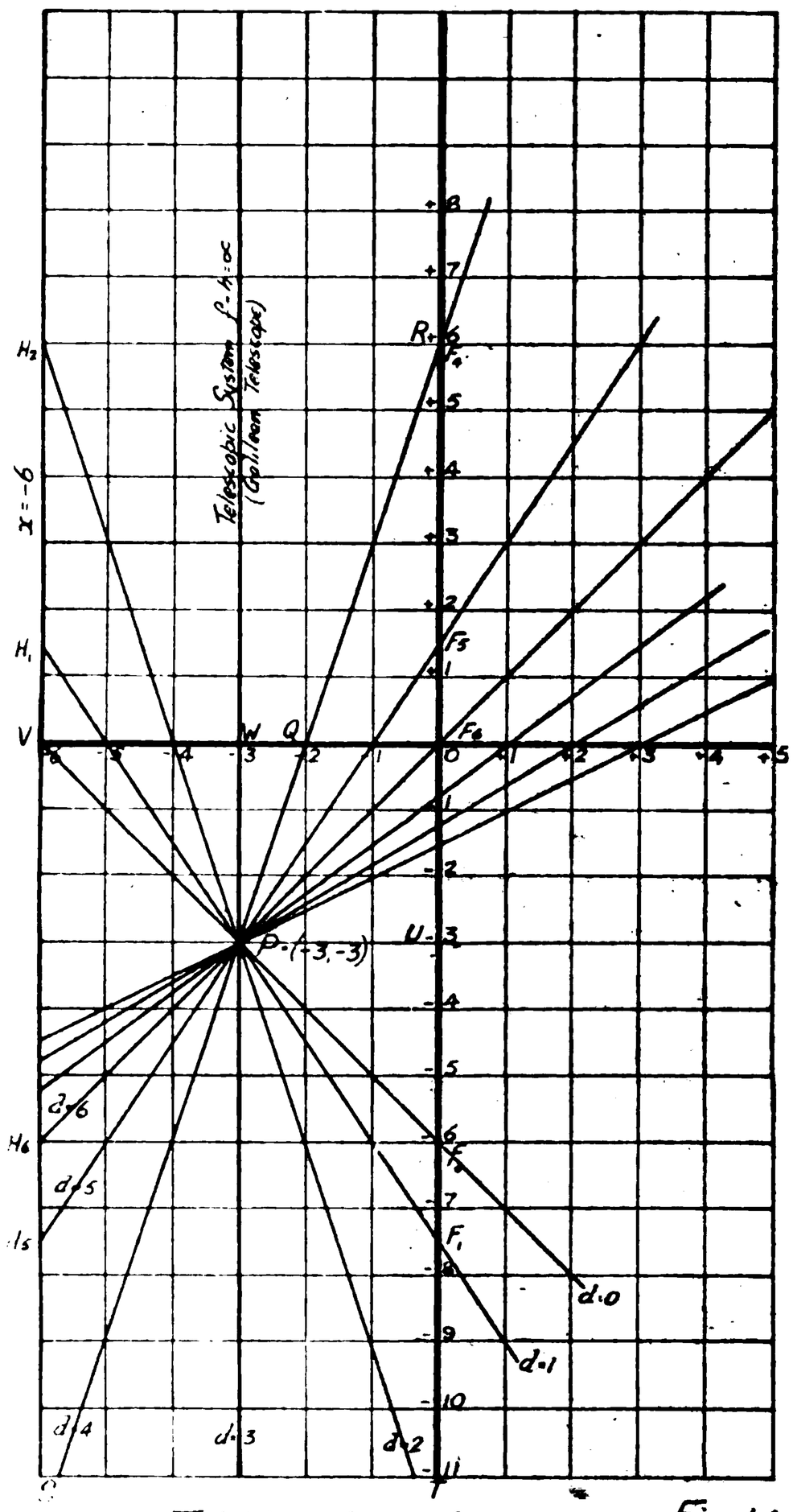


Fig 13.

Thus the principal planes are both situated on the positive side of the combination at con-

stant and equal distances f from the corresponding lenses, being, as it were, rigidly attached to them and moving apart as the lenses are separated so that the distance between them is equal to that between the lenses.

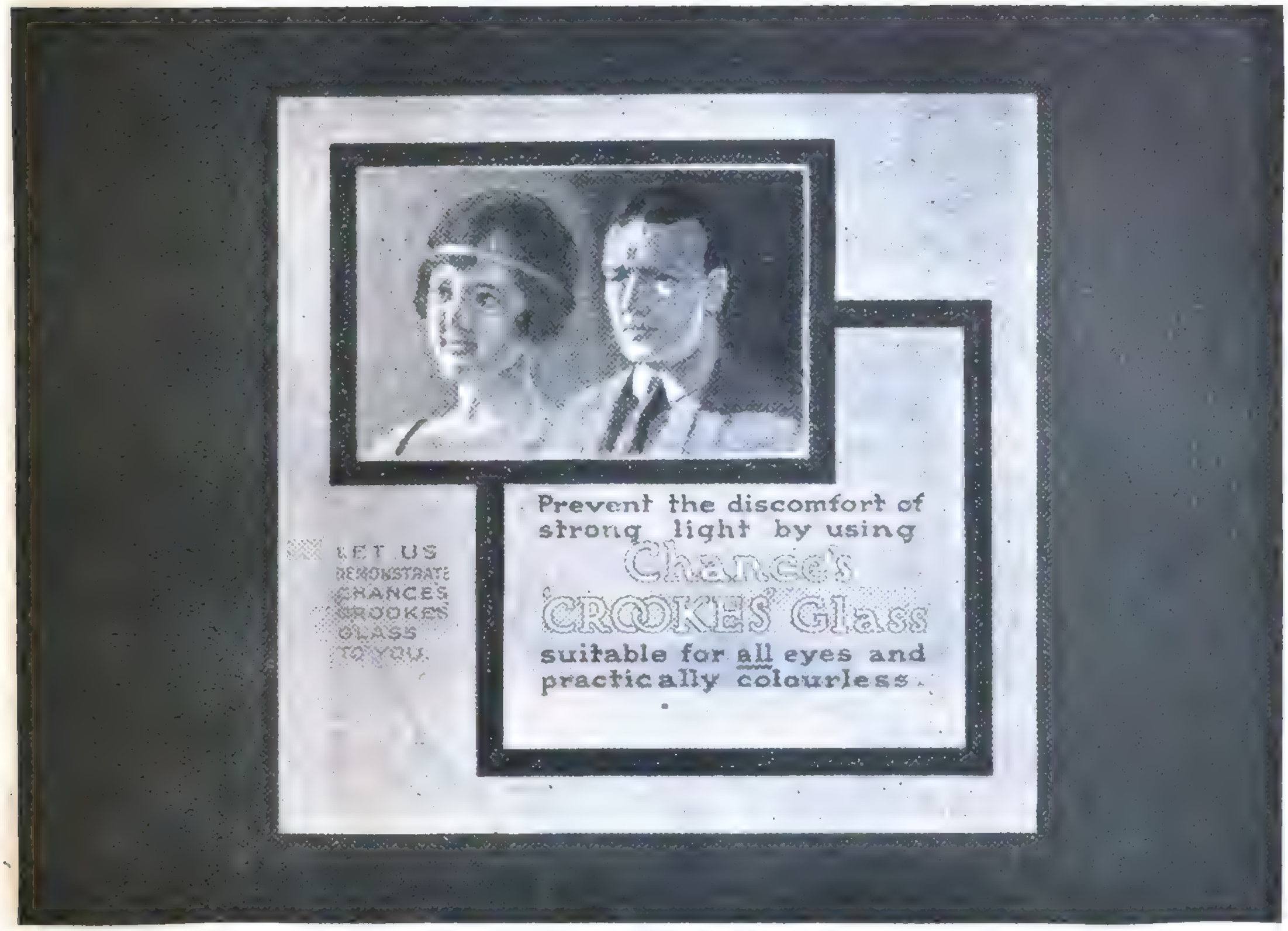
(4) Figs 14 and 15 show the application of the method to a *Telephoto Lens*, in which



Telephoto Lens f1 = +6 f2 = −3 Fig 14.

$f_1 = +6$, and $f_2 = -3$. One case only is here shown, the figures giving the cardinal points appertaining to the negative lens. It will be noticed that for a given separation of the lenses the value of h is much greater than in the previous combinations. An interesting application is the determination of the camera extension and distance of separation required with a given telephoto lens to produce any required magnification. The magnification here means the ratio of the size of the image

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



A Lantern Slide wanting *your* name.

We will supply you free with the above lantern slide, with your name and address incorporated.

The slide is both unusual in design and striking in colour scheme—to which we cannot, of course, do justice in a black-and-white reproduction. In the principles of balanced and pleasing salesmanship it is very far in advance of the great bulk of slides. Its use on your behalf is certain to cause considerable interest. The fact that lighting conditions in theatres and cinemas are very trying to the eyes adds potency to its message.

If you would care to have this slide, please write to us, and we will supply you promptly.

Remember—it is quite free.

CHANCE BROS. & Co., Ltd.,

Glass Works, Smethwick, BIRMINGHAM.



The late Sir William Crookes, O.M., F.R.S.

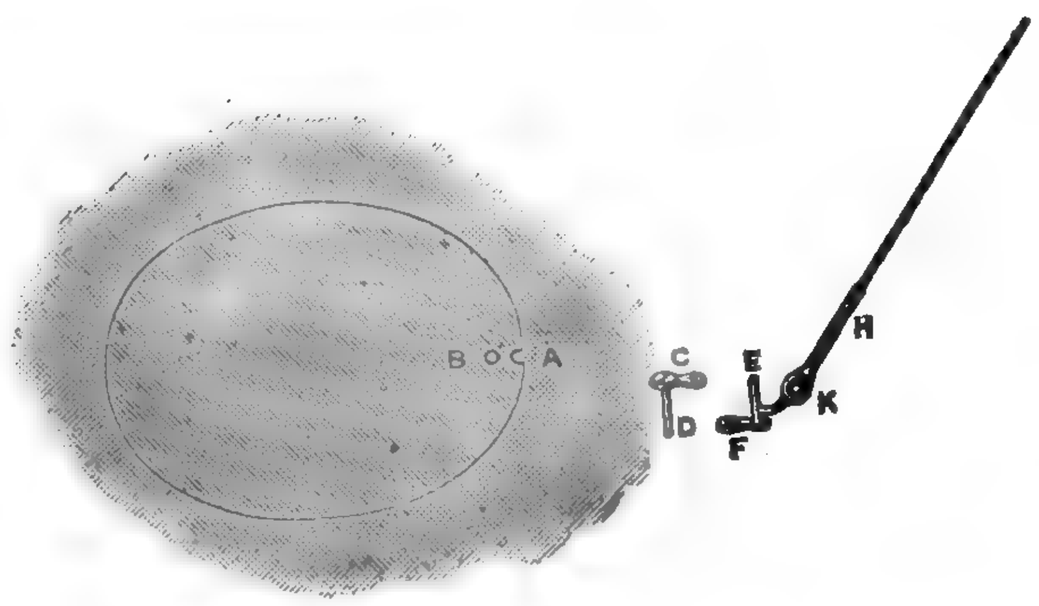
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Phone:—City 3225 (3 lines) ***Telegrams:—Bulford, BARB. London.***

PATENT **"INVISO"** REG. MOUNTINGS

THE Patent **"Inviso"** method of attaching the mountings to the lenses lends itself to extreme lightness. This makes itself apparent in a marked degree in Spectacle mountings, since it obviates the placing of a bearing part of metal against the edges on the lenses, as in the regular form of fitting.



A—Slot in Lens. B—Hole in Lens. C—Loose Strap sliding on E.
D— Screw passing through Lens in fixed Strap F. K—Joint. H—Cable Curlside.

In illustration of lens it will be noted that a narrow slot A, is made in the lens parallel with the hole B, into which the fitted E sinks (Pat. No. 21944). Our patent No. 14838 also provides for a movable strap C so that the lenses of different thickness can be fitted. This in itself is a great advantage over the regular mounts, which being rigid cannot be fitted with the accurate precision which is so necessary when dealing with lenses of so many different thicknesses, which so often, are between the regular sizes made. The **"Inviso"** loose strap overcomes this and moreover a contact fit is made in all cases. The illustrations show the lightness and neat appearance over the regular form in use.

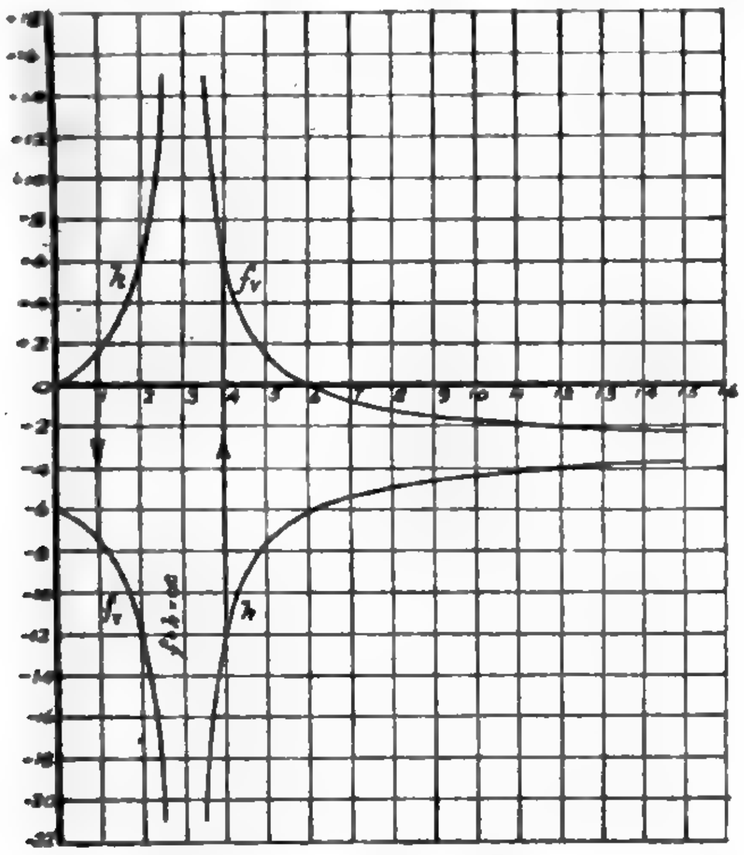
Made by the firm whose Reputation for Prescription Work is:—*"Second to None."*

NEWBOLD & BULFORD, ***Prescription House,***
GOSWELL ROAD, LONDON
E.C.1

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

produced by the telephoto lens to that of the



Telephoto Lens $f_1=+6$ $f_2=-6$

Fig 15.

image produced by the positive lens alone.

Suppose, for example, a magnification m to be required. Then we have, from fig. 14.

$$m=\frac{f}{f_1}=\frac{TR}{ST}=\frac{UR}{PU}=\frac{PW}{WQ}=\frac{WO}{WQ}$$

$$\therefore WQ=\frac{WO}{m}$$

Hence set cursor at $P=(f_2, f_2)$ and Q on OX where $WQ=\frac{f_2}{m}$. Then the intercept OR is the back focal length or camera extension and VQ is the separation of the two lenses. In the figure $m=3$, giving $f_v=6$ and $d=4$.

In the four examples just given f_1 and f_2 have been constant and d variable. But it is equally easy to trace the changes produced by varying f_1 or f_2 or both while d is constant.

We will give one further example:—

(5) *Given* f_1, f_2 and f to *find* d.

Set the cursor at V on OX, where $OV=-f_1$, and at F on OY where $OF=f$. Move cursor

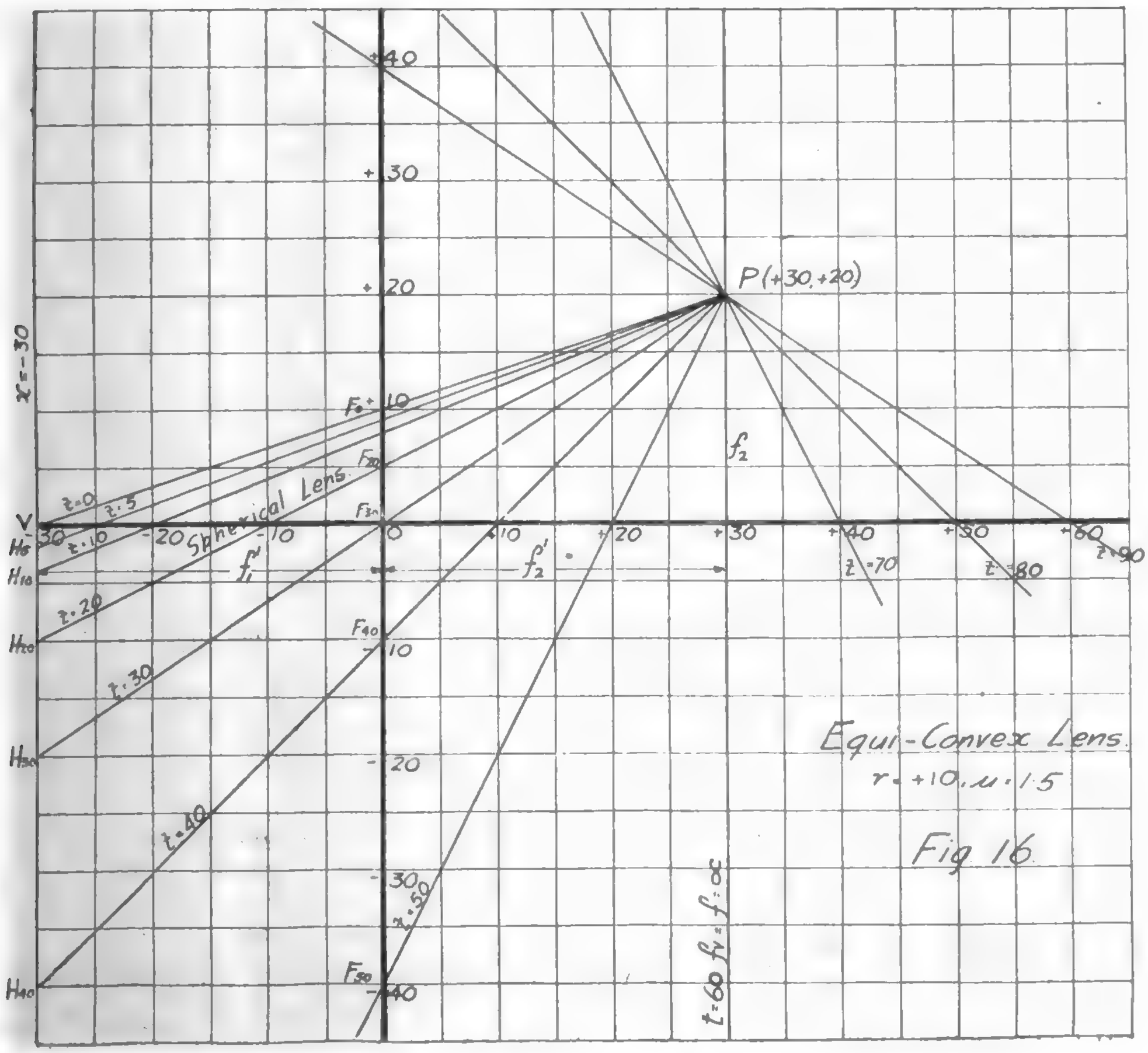
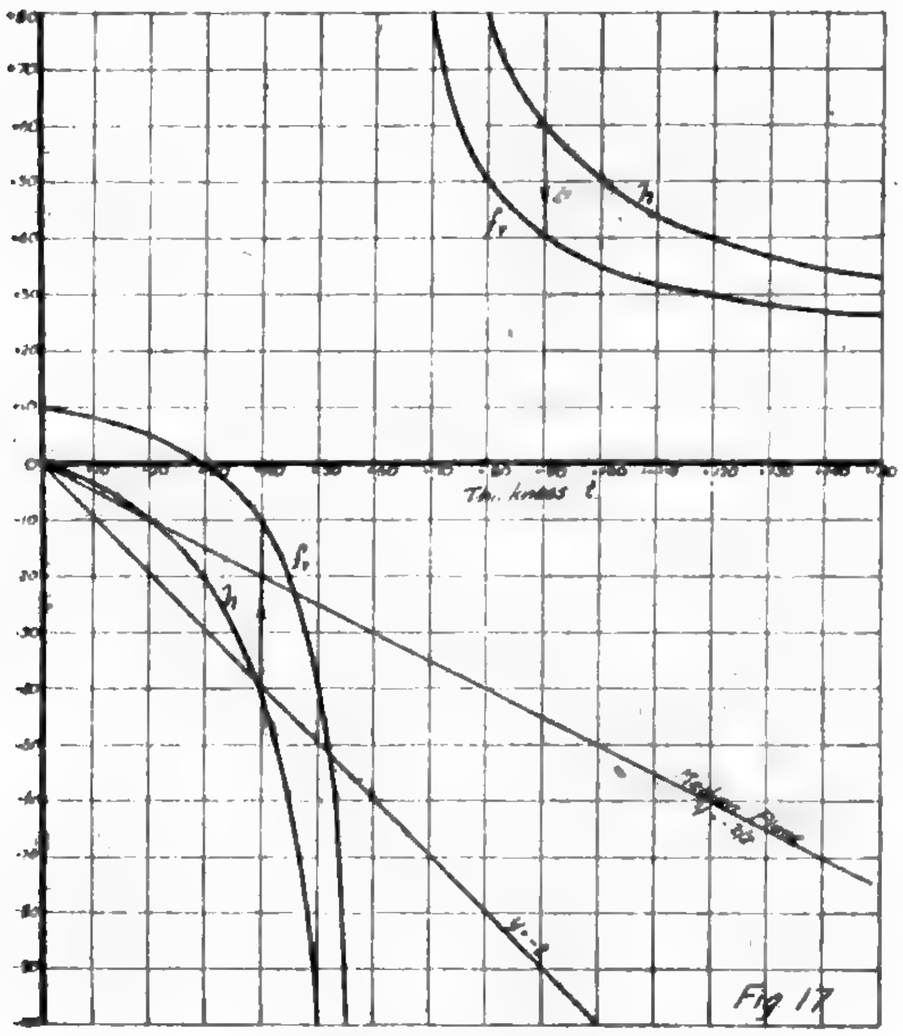


Fig 16.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

to a parallel position passing through $P=(f_2, f_2)$, and note its point of intersection D with OX. Then VD gives the value of d required. If the cursor cannot be made to pass through P, the combination required is impossible.



Equi-Convex Lens r = +10, μ = 1·5

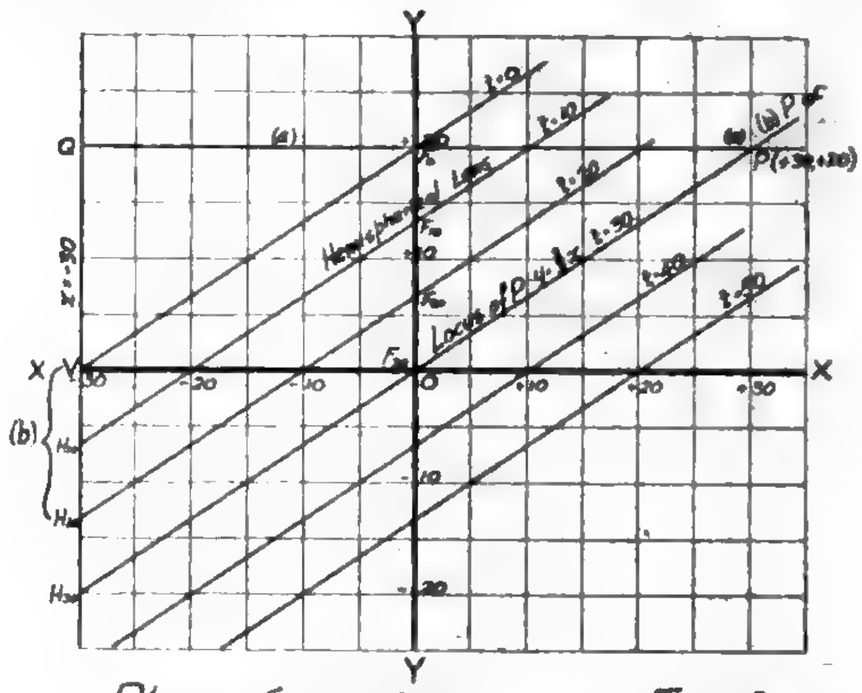
V.—*Refraction at a Spherical Surface.*

In the case of refraction at a single spherical surface the pole P of the diagram is the point (f, f') where f and f' are the first and second focal lengths respectively. They are given by the equations.

$$f=\frac{\mu r}{\mu'-\mu} \text{ and } f'=\frac{\mu' r}{\mu'-\mu} \quad \ldots \quad \ldots \quad (13)$$

where r is the radius of curvature of the surface and μ and μ', the refractive indices of the media on either side of it.

The apparatus is used as described in II. (1) to (3), but the line OP in this case, instead of



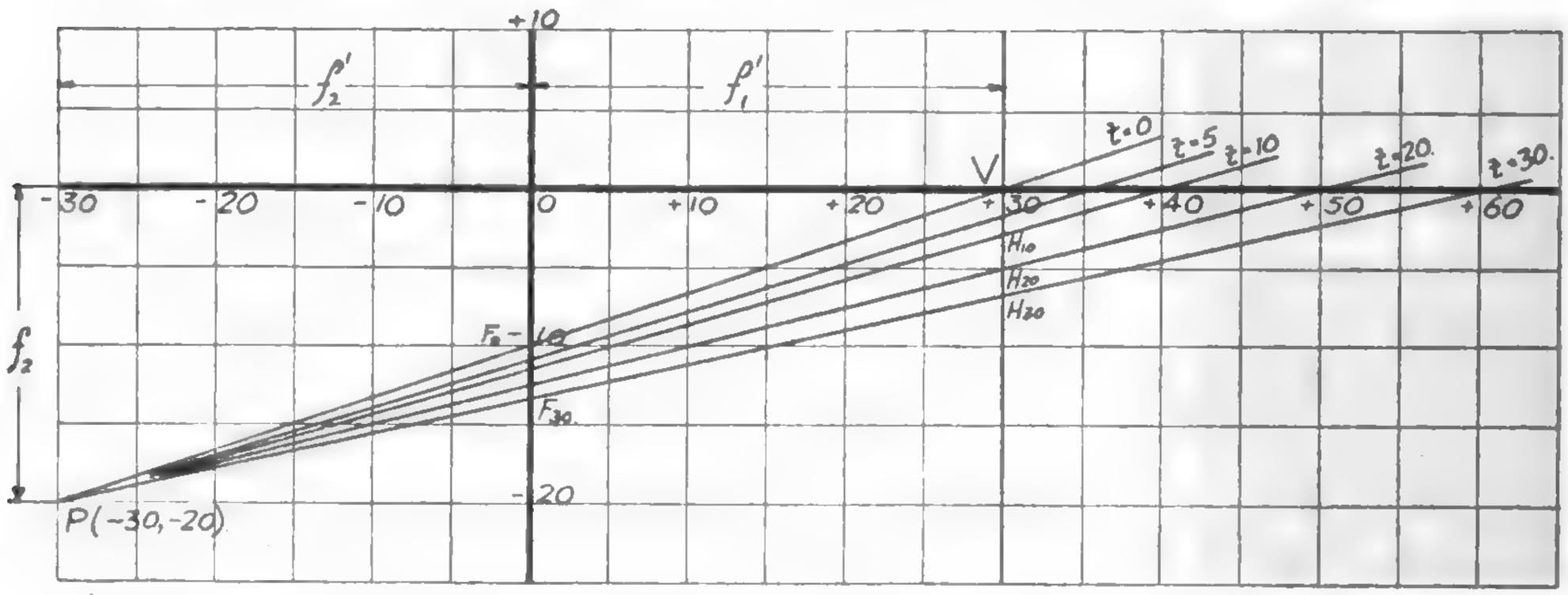
Plano-Convex Lens. Fig. 19

(a) $r_1=\infty$, $r_2=+10$
(b) $r_1=+10$, $r_2=\infty$
$\mu=1.5$

being equally inclined to the two axes, makes an angle $\tan^{-1}\frac{\mu'}{\mu}$ with OX while the magnification β is determined as described in I (2).

VI.—*Determination of the Cardinal Points of a Thick Lens.*

We will take first the case of a lens having the same medium on both sides, so that the nodal and principal point coincide. Let



Equi-concave Lens. r = -10, μ = 1·5, Fig. 18.

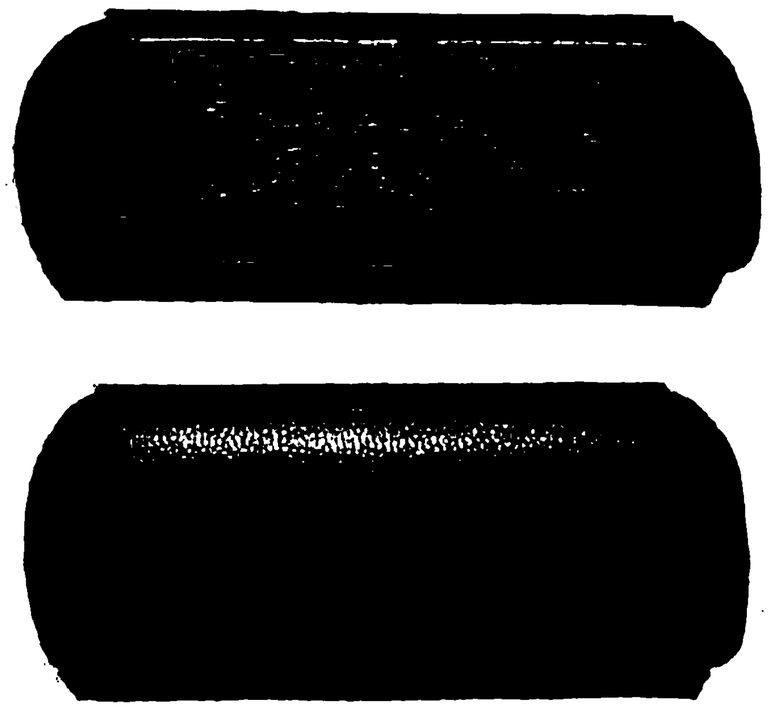
f_1, f'_1, and f'_2, f_2, be the first and second focal lengths for the two surfaces taken in order so that f_1 and f_2 are the focal lengths for parallel light within the lens while f'_1 and f'_2, are the focal lengths for parallel light in the surrounding medium.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

"WERTEX"

WILLMOTTS'

LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.



"WERTEX" Cases are Supplied in

4 Sizes

3 Grains

3 Colours.

Particulars from Your Dealer or direct from the Manufacturers.

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

ENGLAND.

C

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Wherever You are

and

Whatever Your Needs

the L.O.C. organisation is ready to help you—*really* help you. We believe that if we take care of our customers, our profits will take care of themselves. And we've proved it.

Of course, if you happen to be located in Sydney, or Shanghai, Johannesburg or Jamestown, we can hardly expect you to send along all your Rx orders, as is the practice of our friends in the British Isles. All the same, it would surprise you to know how much Rx work we do handle for opticians in far-off places.

When it comes to your general optical requirements—frames, cases, trial lenses, parts, sundries—you'll certainly find it worth your while to make our acquaintance, wherever you are. Why not let us have an idea of your needs and learn what we can do for you ?

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris. France.

Also at—2, Str-Bursei, Bucharest, Roumania.

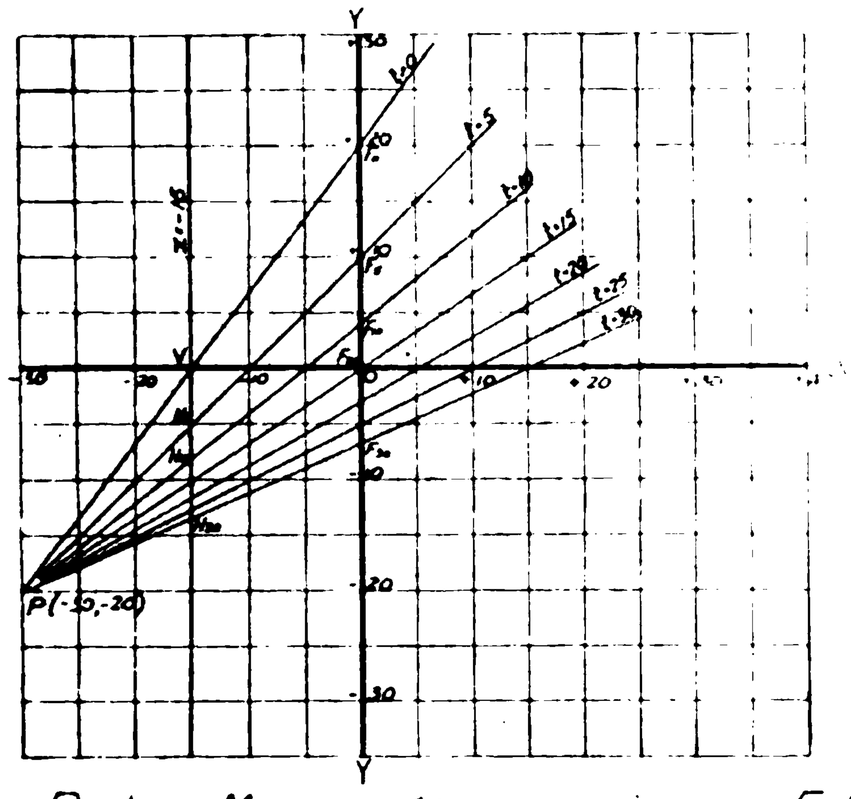
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The formulæ for the equivalent focal length f, the (back) vertex focal length f_v, and the distances h_1, h_2, of the principal points from the corresponding vertices are:—

$$f=\frac{f_1'f_2}{f_1'+f_2'-t},\ f_v=\frac{(f_1'-t)f_2}{f_1'+f_2'-t}$$

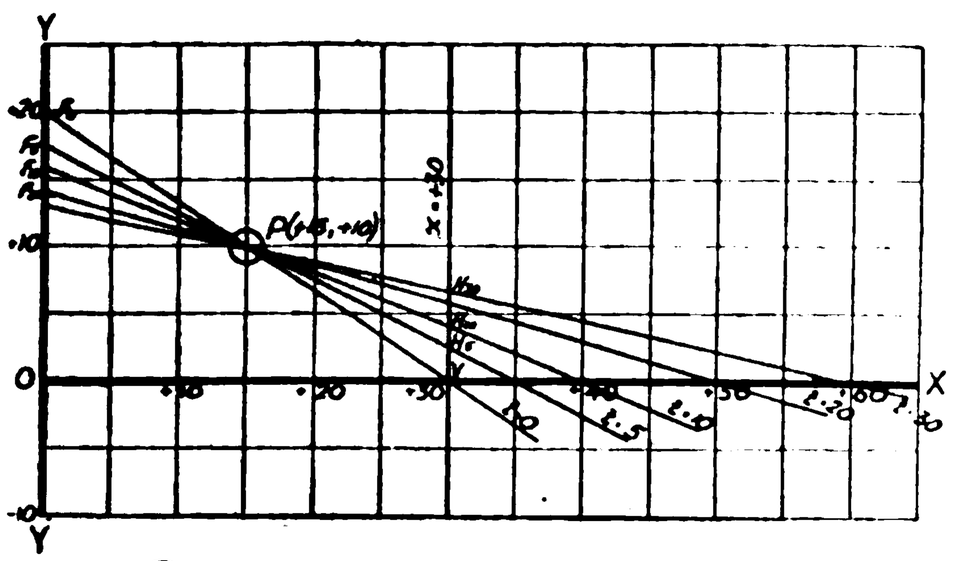
$$h_1=-\frac{f_1t}{f_1'+f_2'-t},\ h_2=-\frac{f_2t}{f_1'+f_2'-t} \quad \ldots \quad (14)$$



Positive Meniscus. (a) $r_1=5$, $r_2=-10$, $\mu=1.5$. Fig. 20.

where t is the thickness of the lens. These equations are of the same form as those of (12) for two separated lenses, and a similar construction therefore, applies. We give below a few examples.

(1) *Equi-Convex Lens.* $r=+10$, $\mu=1.5$, (μ is here the relative refractive index of the



Positive Meniscus (b) $r_1=-10$, $r_2=+5$, $\mu=1.5$

Fig. 21.

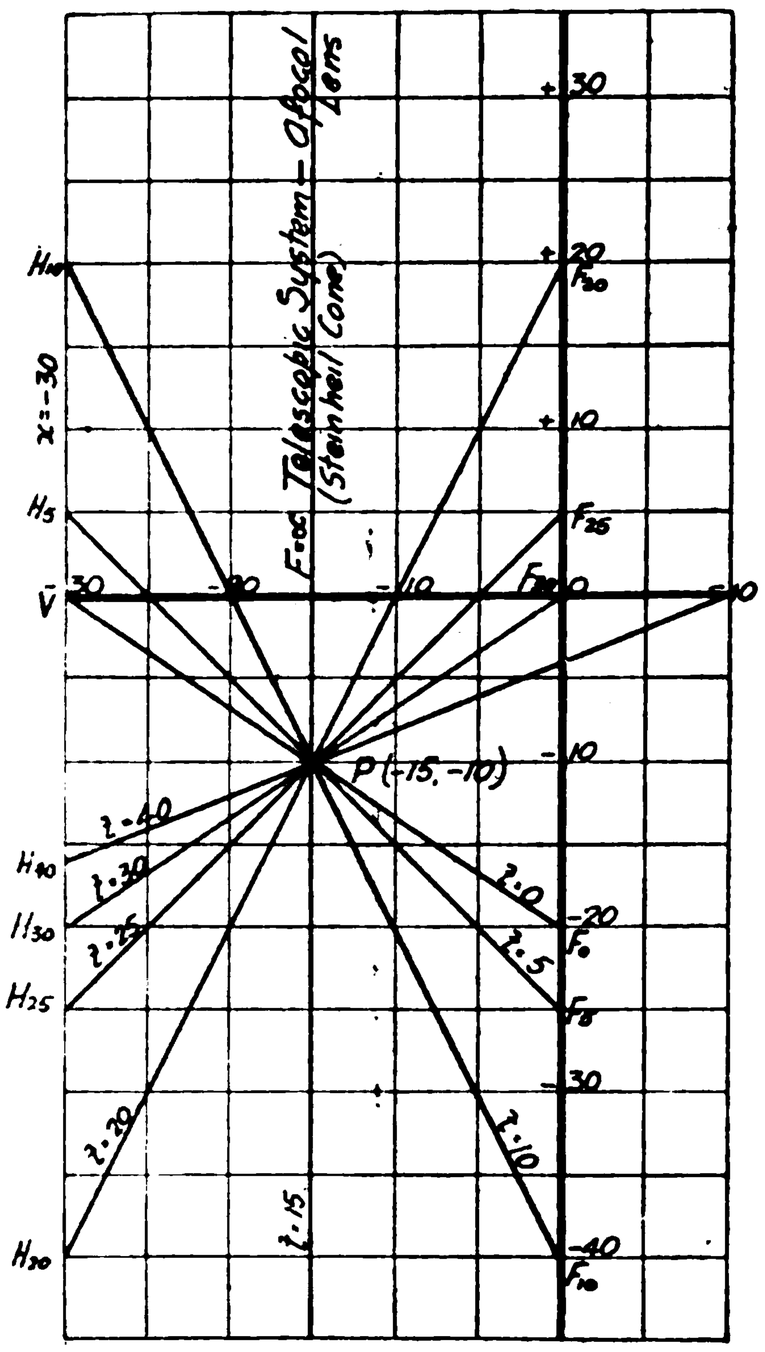
two media and not the μ of the general case dealt with in V).

Hence $f_1=20$, $f'_1=30$, $f'_2=30$, $f_2=20$.

The cursor is set at P=(+30, +20) and at $-(f'_1=t)=-(30=t)$ on OX (fig. 16) f_v and h are read off as before. This and fig. 17 are very similar to figs. 8 and 9 for a pair of positive lenses except as regards the crossing of the principal planes. From the figures it will be seen that between $t=0$ and $t=20$, the principal planes are between the lenses and are not crossed. When $t=20$, we have the spherical lens and the principal planes coincide at the centre; beyond $t=20$ the planes are crossed, coinciding with the surfaces when $t=40$; when $t=60$ (*i.e.*, $f'_1+f'_2$) we have a telescopic system in which the principal foci and planes are at infinity and for this value of t the equivalent focal length changes sign from positive to negative.

(2) *Equi-concave Lens.* $r=-10$, $\mu=1.5$.

Here $f_1=-20$, $f'_1=-30$, $f'_2=-30$, $f_2=-20$. Pole P is at (−30, −20). (fig. 18).



Negative Meniscus. Fig. 23

(a) $r_1=+10$, $r_2=-5$, $\mu=1.5$

Note general similarity to case of pair of negative lenses (fig. 10) as regards sign of equivalent focal length and positions of principal planes.

(3) *Plano-Convex Lens.* (*a*) $r_1=\infty$, $r_2=+10$, $\mu=1.5$. Hence $f_1=\infty$, $f_1'=\infty$, $f_2'=+30$, $f_2=+20$.

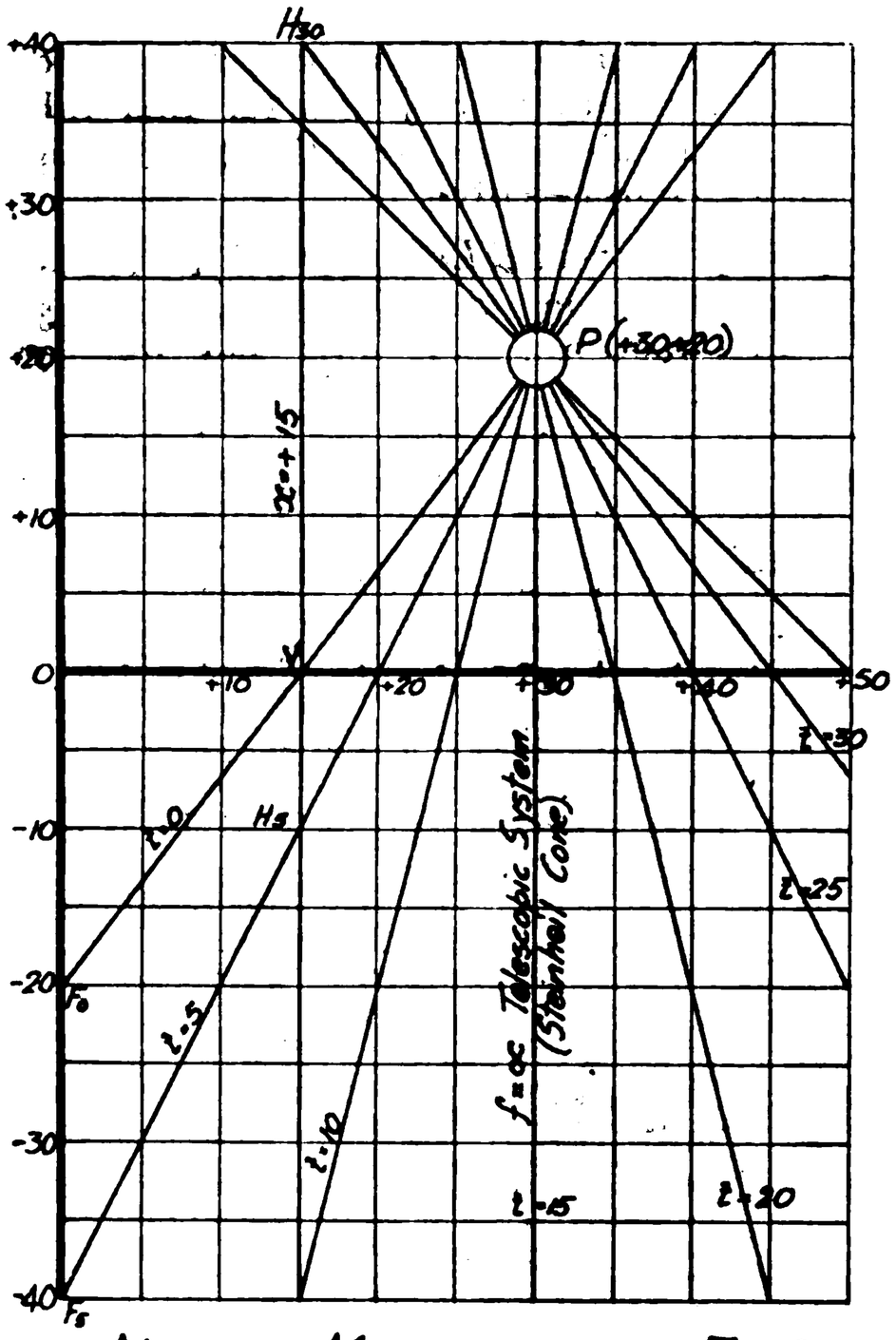
Pole P is at (+30, +20). Cursor is set (fig. 19). at P and at $-(\infty-t)=-\infty$ on OX. It is therefore in the position PQ parallel to OX. Hence for all values if t $f_v=+20$, $h=0$ and therefore $f=+20$. This must be regarded

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

as a limiting case of (1) fig. 16, in which t remains finite while V moves to $-\infty$ along OX, when it will be seen that $VH = h$ vanishes.

(*b*) $r_1 = +10$, $r_2 = \infty$, $\mu = 1.5$.

$\therefore f_1 = +20$, $f_1' = +30$, $f_2' = \infty$, $f_2 = \infty$.



Negative Meniscus. Fig. 24.

(b) $r_1 = -5$, $r_2 = +10$, $\mu = 1.5$.

Here pole is at ∞ on OP. The cursor is therefore set parallel to OP., passing through $-(30-t)$ on OX. Thus for various values of t we get a family of lines parallel to OP. Here h is obviously $\frac{2}{3}t$; +, in general, $\frac{t}{\mu}$.

(4) *Plano-concave Lens.* The diagram will be somewhat similar to that of example (3) but P will be in the opposite quadrant.

(5) *Positive Meniscus or Periscopic Convex.*

(*a*) $r_1 = +5$, $r_2 = -10$, $\mu = 1.5$.

Hence $f_1 = +10$, $f_1' = +15$, $f_2' = -30$, $f_2 = -20$

Set cursor at $P = (-30, -20)$ and $-(f'-t) = -(15-t)$ (fig. 20). It may be noted that h is always negative, that when $t < 5$, $h > t$, and the principal plane therefore lies outside the lens beyond the convex surface, when $t = 5$, it coincides with the convex surface, and when $t > 5$, it lies within the lens,

(*b*) $r_1 = -10$, $r_2 = +5$, $\mu = 1.5$.

Hence $f_1 = -20$, $f_1' = -30$, $f_2' = +15$, $f_2 = +10$

The cursor is set at $P = (+15, +10)$ and at $-(f_1'-t) = -(-30-t) = 30+t$ (fig. 21). It will be observed that h is always positive and less than t. The principal plane is therefore always outside the lens and on the convex side. It may also be seen from both figures that f is always positive.

(6) *Negative Meniscus or Periscopic Concave.*

(*a*) $r_1 = +10$, $r_2 = -5$, $\mu = 1.5$.

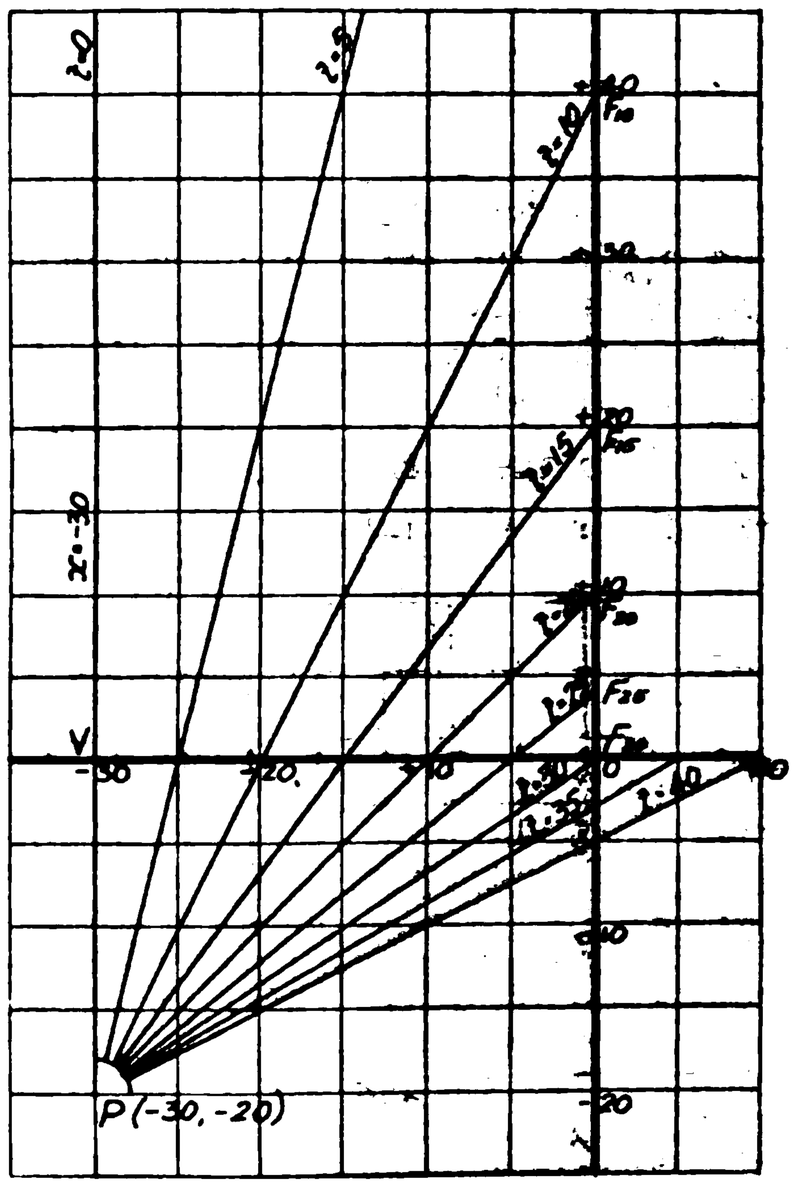
Hence $f_1 = +20$, $f'_1 = +30$, $f'_2 = -15$, $f_2 = -10$

The cursor is set at $P = (-15, -10)$ and at $-(f_1'-t) = -(30-t)$ on OX (fig. 23).

(*b*) $r_1 = -5$, $r_2 = +10$, $\mu = 1.5$.

Hence $f_1 = -10$, $f_1' = -15$, $f_2' = +30$, $f_2 = +20$, and the cursor is set at $P = (+30, +20)$ and at $-(f'-t) = -(-15-t) = 15+t$ on OX (fig. 24).

It will be seen from the figures that while



Equi-Curved Lens. Fig 26.

(a) $r_1 = +10$, $r_2 = -10$, $\mu = 1.5$.

for the positive meniscus f is positive for all values of t, this is not so in the case of the so-called negative meniscus. In the example given f is negative for the value $t=0$ to $t=15$, becoming infinite at the latter value, giving a telescopic system, the Steinheil Cone, while beyond $t=15$, f becomes positive.

Another special case occurs when $t=5$ and the two centres of curvature coincide giving

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



A Lantern Slide wanting *your* name.

We will supply you free with the above lantern slide, with your name and address incorporated.

The slide is both unusual in design and striking in colour scheme—to which we cannot, of course, do justice in a black-and-white reproduction. In the principles of balanced and pleasing salesmanship it is very far in advance of the great bulk of slides. Its use on your behalf is certain to cause considerable interest. The fact that lighting conditions in theatres and cinemas are very trying to the eyes adds potency to its message.

If you would care to have this slide, please write to us, and we will supply you promptly.

Remember—it is quite free.

CHANCE BROS. & Co., Ltd.,
Glass Works, Smethwick, BIRMINGHAM.



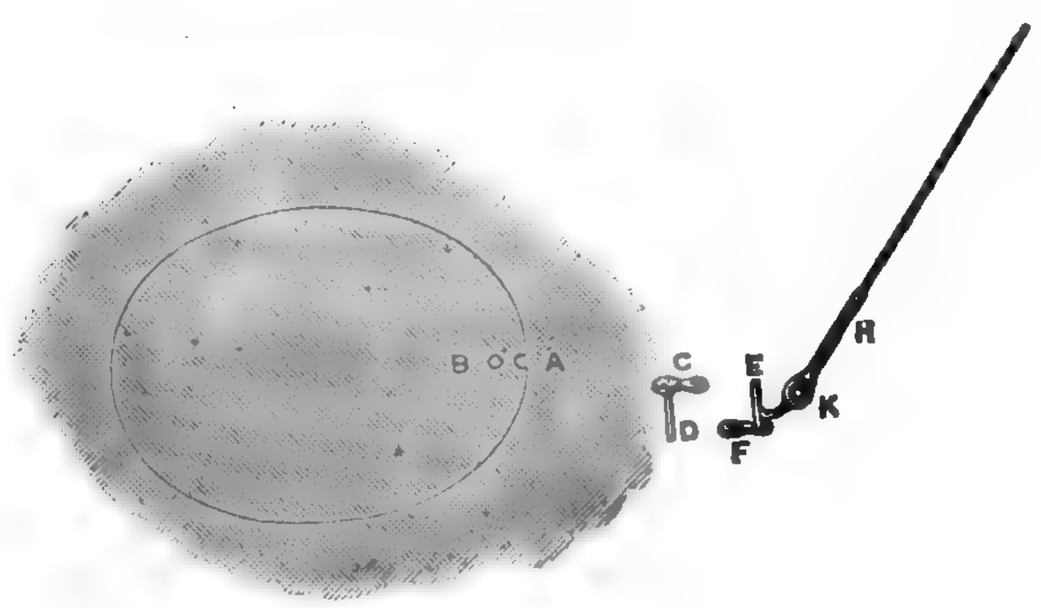
The late Sir William Crookes, O.M., F.R.S.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Phone:—City 3225 (3 lines) *Telegrams:—Bulford, BARB. London.*

PATENT "INVISO" REG. MOUNTINGS

THE Patent "**Inviso**" method of attaching the mountings to the lenses lends itself to extreme lightness. This makes itself apparent in a marked degree in Spectacle mountings, since it obviates the placing of a bearing part of metal against the edges on the lenses, as in the regular form of fitting.



A—Slot in Lens. B—Hole in Lens. C—Loose Strap sliding on E.
D— Screw passing through Lens in fixed Strap F. K—Joint. H—Cable Curlside.

In illustration of lens it will be noted that a narrow slot A, is made in the lens parallel with the hole B, into which the fitted E sinks (Pat. No. 21944). Our patent No. 14838 also provides for a movable strap C so that the lenses of different thickness can be fitted. This in itself is a great advantage over the regular mounts, which being rigid cannot be fitted with the accurate precision which is so necessary when dealing with lenses of so many different thicknesses, which so often, are between the regular sizes made. The "**Inviso**" loose strap overcomes this and moreover a contact fit is made in all cases. The illustrations show the lightness and neat appearance over the regular form in use.

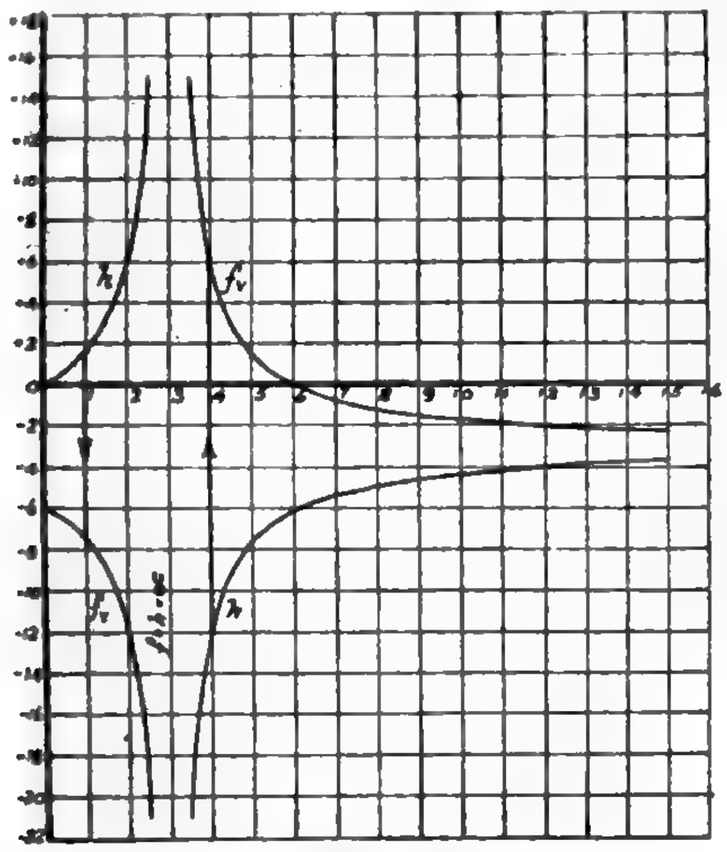
Made by the firm whose Reputation for Prescription Work is:—*"Second to None."*

NEWBOLD & BULFORD, *Prescription House,* **GOSWELL ROAD, LONDON E.C.1**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

produced by the telephoto lens to that of the



Telephoto Lens f_1 +6 f_2 −6.

Fig 15.

image produced by the positive lens alone.

Suppose, for example, a magnification m to be required. Then we have, from fig. 14.

$$m = \frac{f}{f_1} = \frac{TR}{ST} = \frac{UR}{PU} = \frac{PW}{WQ} = \frac{WO}{WQ}$$

$$\therefore WQ = \frac{WO}{m}$$

Hence set cursor at $P = (f_2, f_2)$ and Q on OX where $WQ = \frac{f_2}{m}$. Then the intercept OR is the back focal length or camera extension and VQ is the separation of the two lenses. In the figure $m = 3$, giving $f_v = 6$ and $d = 4$.

In the four examples just given f_1 and f_2 have been constant and d variable. But it is equally easy to trace the changes produced by varying f_1 or f_2 or both while d is constant.

We will give one further example:—

(5) *Given* f_1, f_2 and f to *find* d.

Set the cursor at V on OX, where $OV = -f_1$, and at F on OY where $OF = f$. Move cursor

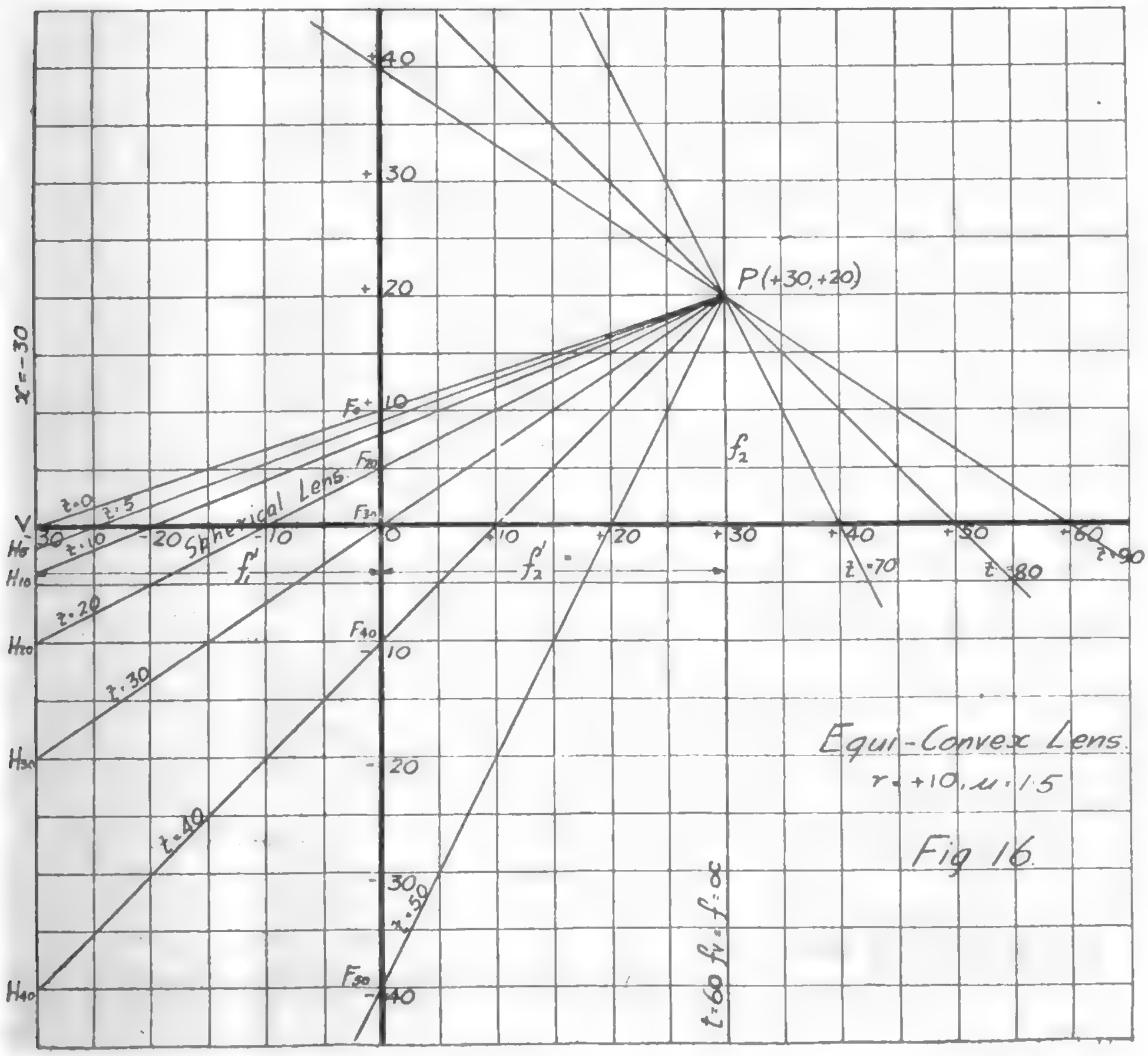
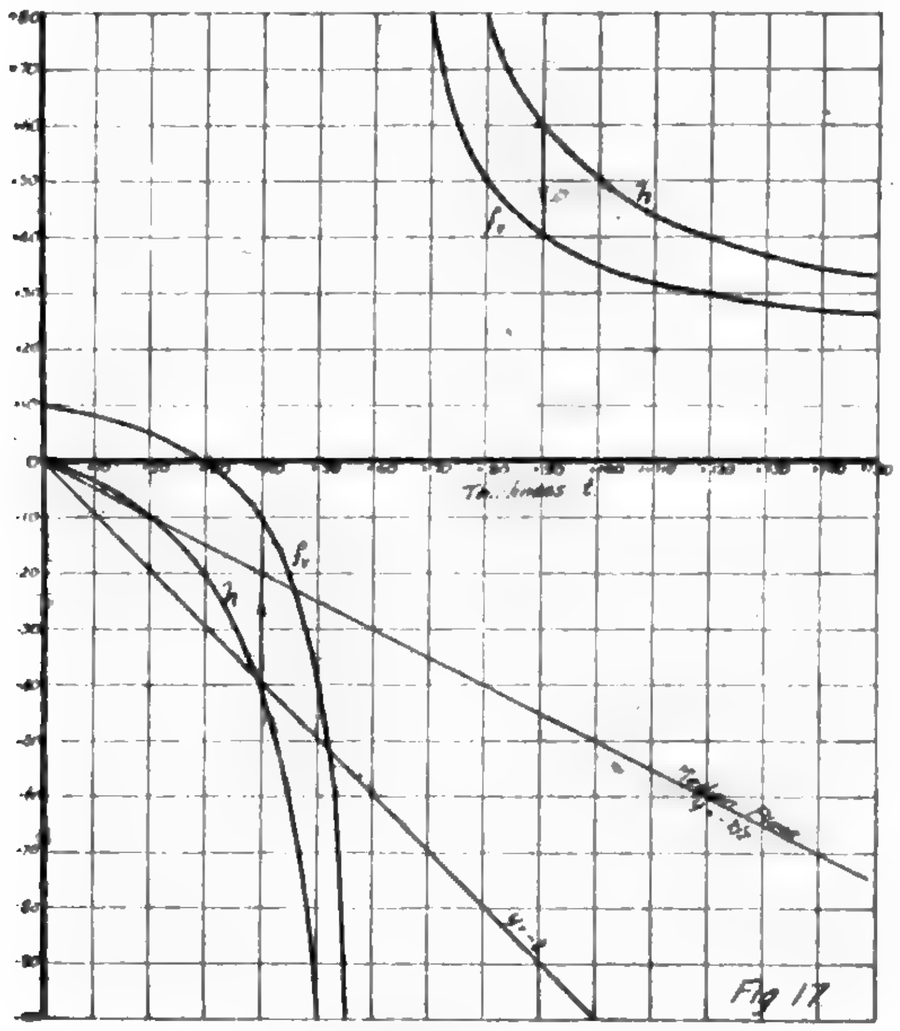


Fig 16.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

to a parallel position passing through $P=(f_2, f_2)$, and note its point of intersection D with OX. Then VD gives the value of d required. If the cursor cannot be made to



Equi-Convex Lens r = +10, μ = 1·5

pass through P, the combination required is impossible.

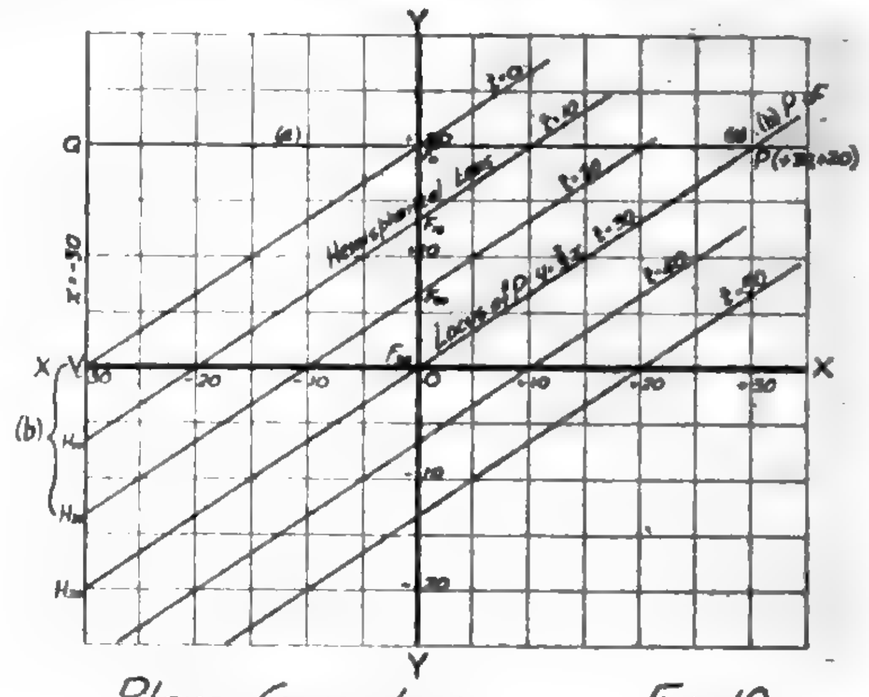
V.—*Refraction at a Spherical Surface.*

In the case of refraction at a single spherical surface the pole P of the diagram is the point (f, f') where f and f' are the first and second focal lengths respectively. They are given by the equations.

$$f=\frac{\mu r}{\mu'-\mu} \text{ and } f'=\frac{\mu' r}{\mu'-\mu} \quad \ldots \quad \ldots \quad (13)$$

where r is the radius of curvature of the surface and μ and μ', the refractive indices of the media on either side of it.

The apparatus is used as described in II. (1) to (3), but the line OP in this case, instead of

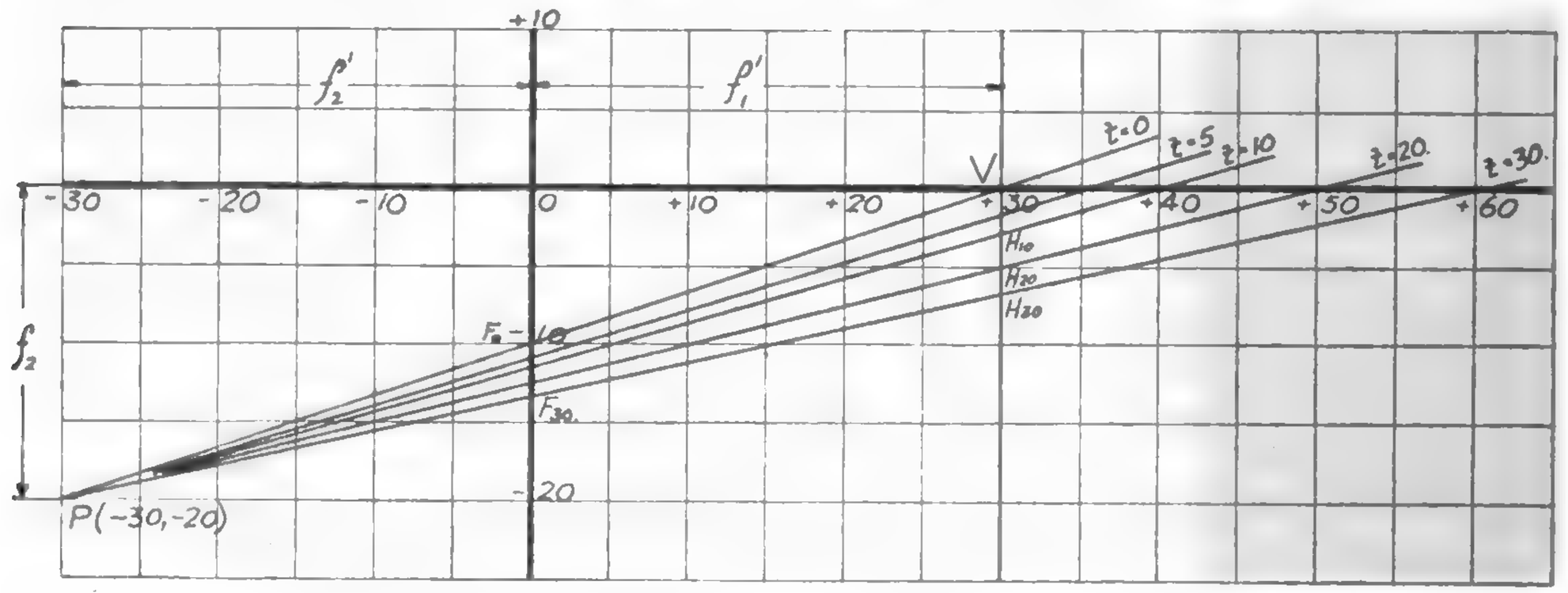


(a) $r_1=\infty$, $r_2=+10$ } $\mu=1.5$
(b) $r_1=+10$, $r_2=\infty$ }

being equally inclined to the two axes, makes an angle $\tan^{-1}\frac{\mu'}{\mu}$ with OX while the magnification β is determined as described in I (2).

VI.—*Determination of the Cardinal Points of a Thick Lens.*

We will take first the case of a lens having the same medium on both sides, so that the nodal and principal point coincide. Let



Equi-concave Lens. r = -10, μ = 1·5. Fig. 18.

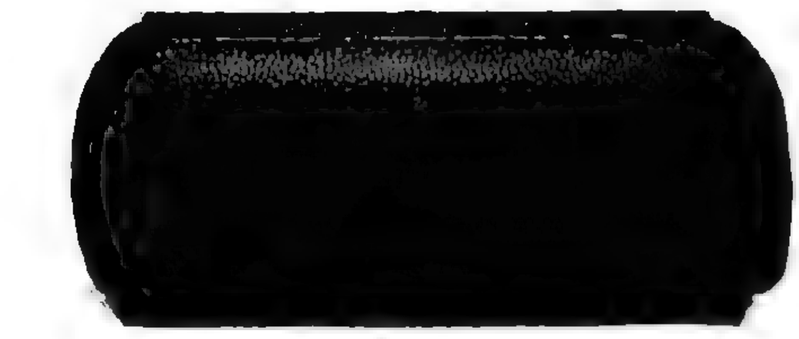
f_1, f'_1, and f'_2, f_2, be the first and second focal lengths for the two surfaces taken in order so that f_1 and f_2 are the focal lengths for parallel light within the lens while f'_1 and f'_2, are the focal lengths for parallel light in the surrounding medium.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

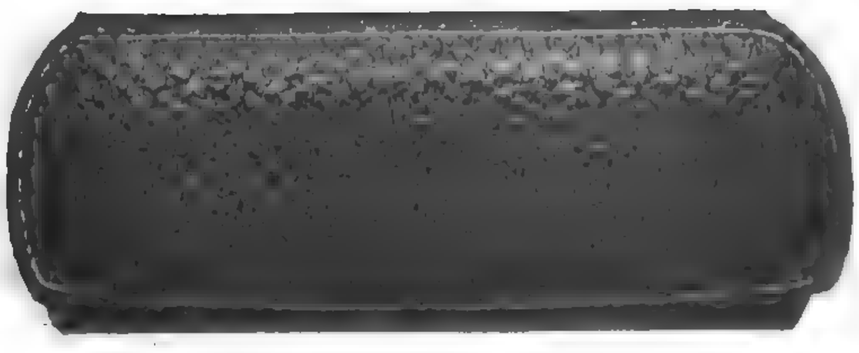
"WERTEX"
WILLMOTTS'
LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.



"WERTEX" Cases are Supplied in
4 Sizes
3 Grains
3 Colours.







Particulars from Your Dealer or direct from the Manufacturers.

WILLMOTTS LIMITED,
EVESHAM, WORCESTERSHIRE,
ENGLAND.

C

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Wherever You are

and

Whatever Your Needs

the L.O.C. organisation is ready to help you—*really* help you. We believe that if we take care of our customers, our profits will take care of themselves. And we've proved it.

Of course, if you happen to be located in Sydney, or Shanghai, Johannesburg or Jamestown, we can hardly expect you to send along all your Rx orders, as is the practice of our friends in the British Isles. All the same, it would surprise you to know how much Rx work we do handle for opticians in far-off places.

When it comes to your general optical requirements—frames, cases, trial lenses, parts, sundries—you'll certainly find it worth your while to make our acquaintance, wherever you are. Why not let us have an idea of your needs and learn what we can do for you ?

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris. France.

Also at—2, Str-Bursei, Bucharest, Roumania.

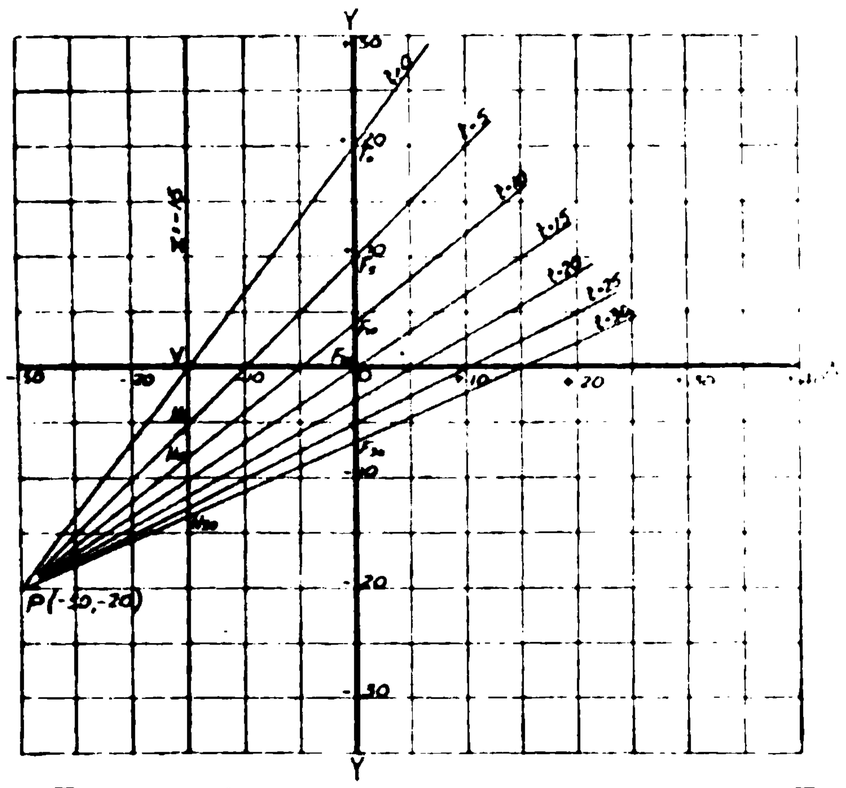
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The formulæ for the equivalent focal length f, the (back) vertex focal length f_v, and the distances h_1, h_2, of the principal points from the corresponding vertices are:—

$$f=\frac{f_1'f_2}{f_1'+f_2'-t},\ f_v=\frac{(f_1'-t)f_2}{f_1'+f_2'-t}$$

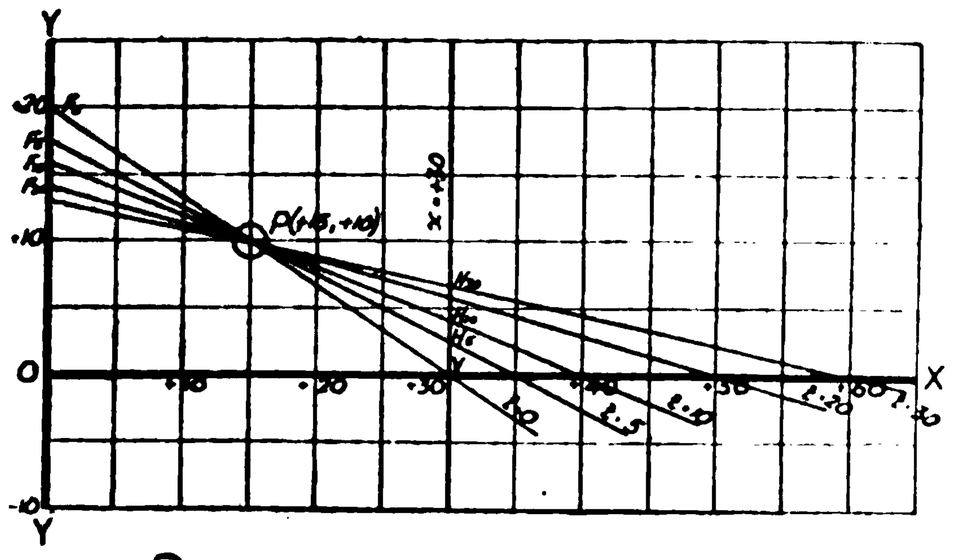
$$h_1=-\frac{f_1t}{f_1'+f_2'-t},\ h_2=-\frac{f_2t}{f_1'+f_2'-t} \quad \ldots \quad (14)$$



Positive Meniscus. (a) $r_1=5$, $r_2=10$, $\mu=1.5$. Fig. 20

where t is the thickness of the lens. These equations are of the same form as those of (12) for two separated lenses, and a similar construction therefore, applies. We give below a few examples.

(1) *Equi-Convex Lens.* $r=+10$, $\mu=1.5$, (μ is here the relative refractive index of the



Positive Meniscus (b) $r_1=-10$, $r_2=+5$, $\mu=1.5$

Fig. 21.

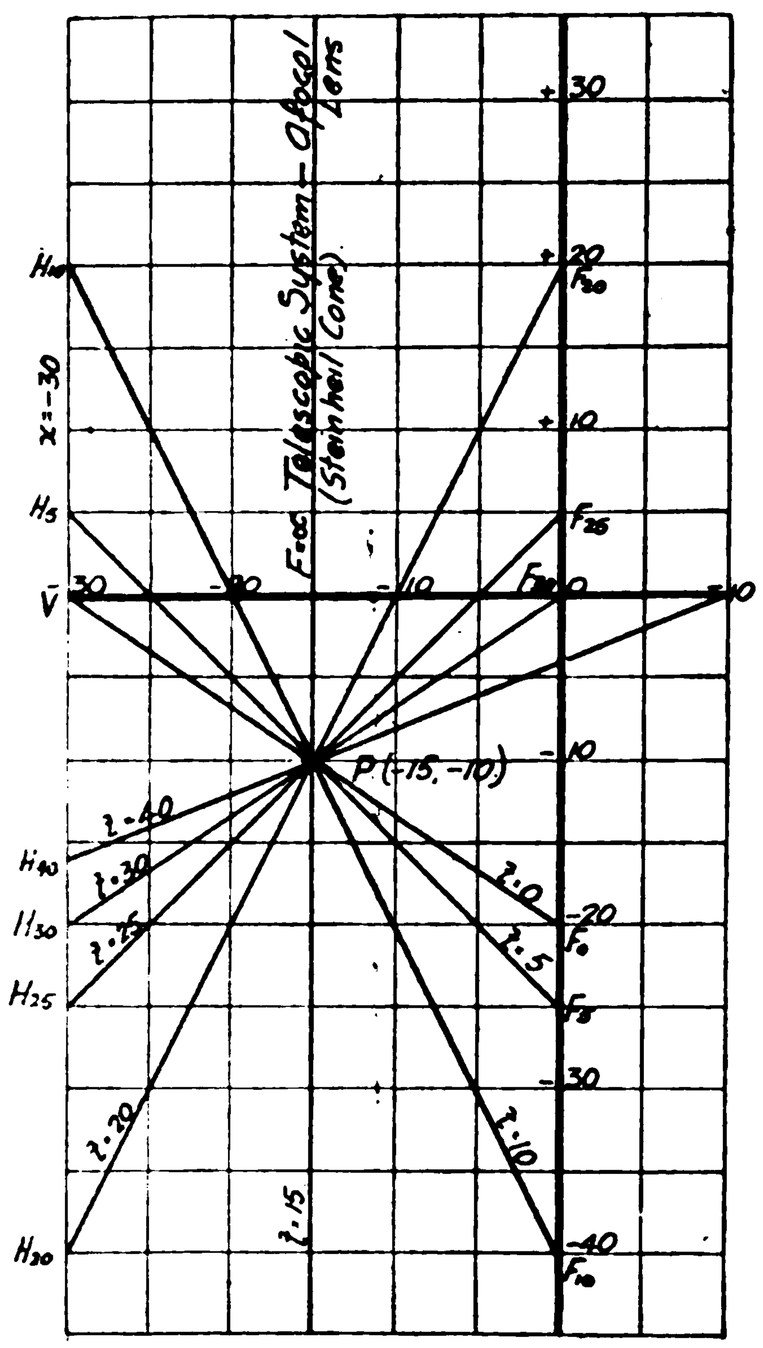
two media and not the μ of the general case dealt with in V).

Hence $f_1=20$, $f'_1=30$, $f'_2=30$, $f_2=20$.

The cursor is set at P=(+30, +20) and at $-(f'_1=t)=-(30=t)$ on OX (fig. 16) f_v and h are read off as before. This and fig. 17 are very similar to figs. 8 and 9 for a pair of positive lenses except as regards the crossing of the principal planes. From the figures it will be seen that between $t=0$ and $t=20$, the principal planes are between the lenses and are not crossed. When $t=20$, we have the spherical lens and the principal planes coincide at the centre; beyond $t=20$ the planes are crossed, coinciding with the surfaces when $t=40$; when $t=60$ (*i.e.*, $f'_1+f'_2$) we have a telescopic system in which the principal foci and planes are at infinity and for this value of t the equivalent focal length changes sign from positive to negative.

(2) *Equi-concave Lens.* $r=-10$, $\mu=1.5$.

Here $f_1=-20$, $f'_1=-30$, $f'_2=-30$, $f_2=-20$. Pole P is at (−30, −20). (fig. 18).



Negative Meniscus. Fig. 23

(a) $r_1=+10$, $r_2=-5$, $\mu=1.5$

Note general similarity to case of pair of negative lenses (fig. 10) as regards sign of equivalent focal length and positions of principal planes.

(3) *Plano-Convex Lens.* (*a*) $r_1=\infty$, $r_2=+10$, $\mu=1.5$. Hence $f_1=\infty$, $f_1'=\infty$, $f_2'=+30$, $f_2=+20$.

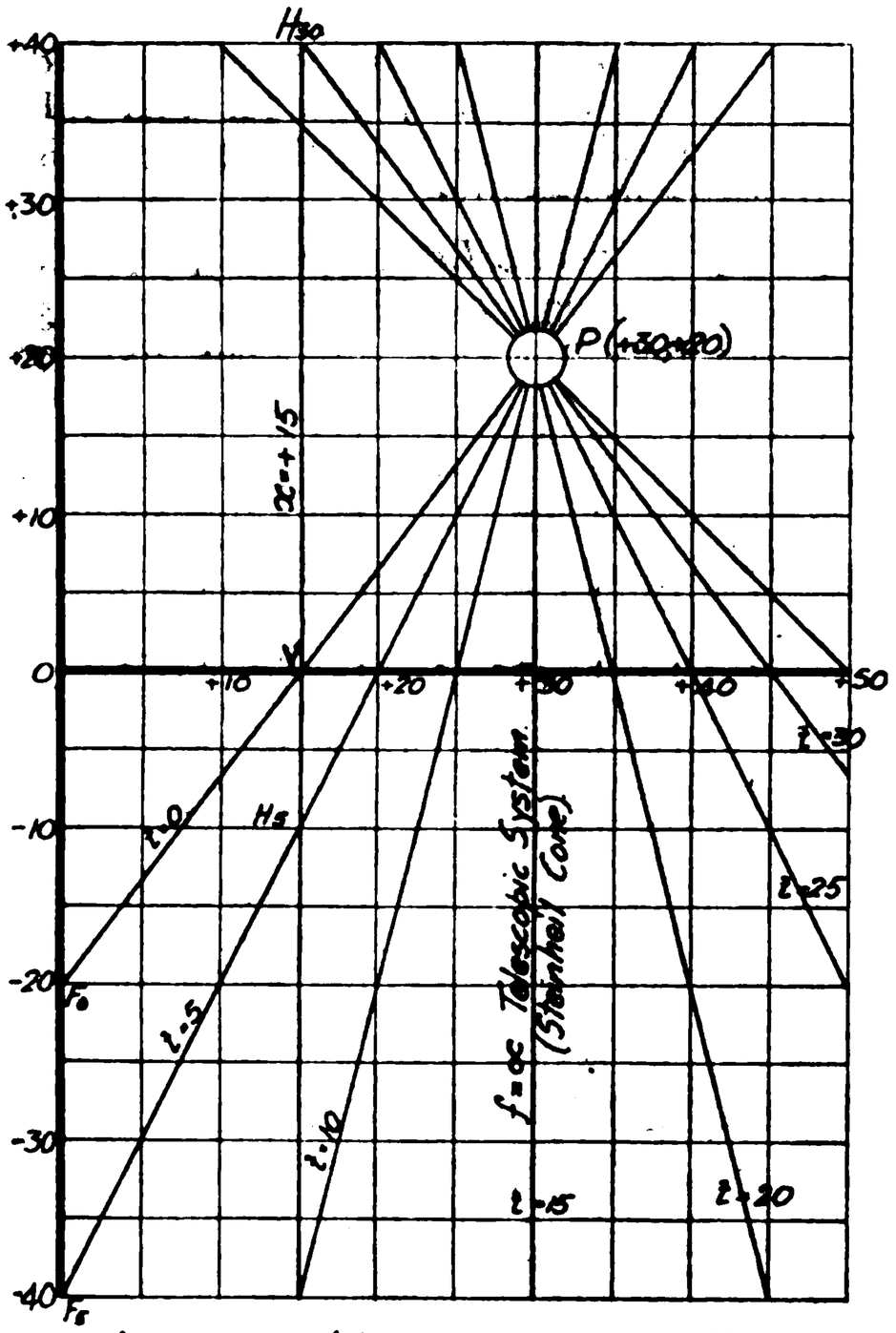
Pole P is at (+30, +20). Cursor is set (fig. 19). at P and at $-(\infty-t)=-\infty$ on OX. It is therefore in the position PQ parallel to OX. Hence for all values if t $f_v=+20$, $h=0$ and therefore $f=+20$. This must be regarded

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

as a limiting case of (1) fig. 16, in which t remains finite while V moves to $-\infty$ along OX, when it will be seen that $VH = h$ vanishes.

(*b*) $r_1 = +10$, $r_2 = \infty$, $\mu = 1.5$.

$\therefore f_1 = +20$, $f_1' = +30$, $f_2' = \infty$, $f_2 = \infty$.



Negative Meniscus. Fig. 24.

(b) $r_1 = -5$, $r_2 = +10$, $\mu = 1.5$.

Here pole is at ∞ on OP. The cursor is therefore set parallel to OP., passing through $-(30-t)$ on OX. Thus for various values of t we get a family of lines parallel to OP. Here h is obviously $\frac{2}{3}t$; +, in general, $\frac{t}{\mu}$.

(4) *Plano-concave Lens.* The diagram will be somewhat similar to that of example (3) but P will be in the opposite quadrant.

(5) *Positive Meniscus or Periscopic Convex.*

(*a*) $r_1 = +5$, $r_2 = -10$, $\mu = 1.5$.

Hence $f_1 = +10$, $f_1' = +15$, $f_2' = -30$, $f_2 = -20$

Set cursor at $P = (-30, -20)$ and $-(f'-t) = -(15-t)$ (fig. 20). It may be noted that h is always negative, that when $t < 5$, $h > t$, and the principal plane therefore lies outside the lens beyond the convex surface, when $t = 5$, it coincides with the convex surface, and when $t > 5$, it lies within the lens.

(*b*) $r_1 = -10$, $r_2 = +5$, $\mu = 1.5$.

Hence $f_1 = -20$, $f_1' = -30$, $f_2' = +15$, $f_2 = +10$

The cursor is set at $P = (+15, +10)$ and at $-(f_1'-t) = -(-30-t) = 30+t$ (fig. 21). It will be observed that h is always positive and less than t. The principal plane is therefore always outside the lens and on the convex side. It may also be seen from both figures that f is always positive.

(6) *Negative Meniscus or Periscopic Concave.*

(*a*) $r_1 = +10$, $r_2 = -5$, $\mu = 1.5$.

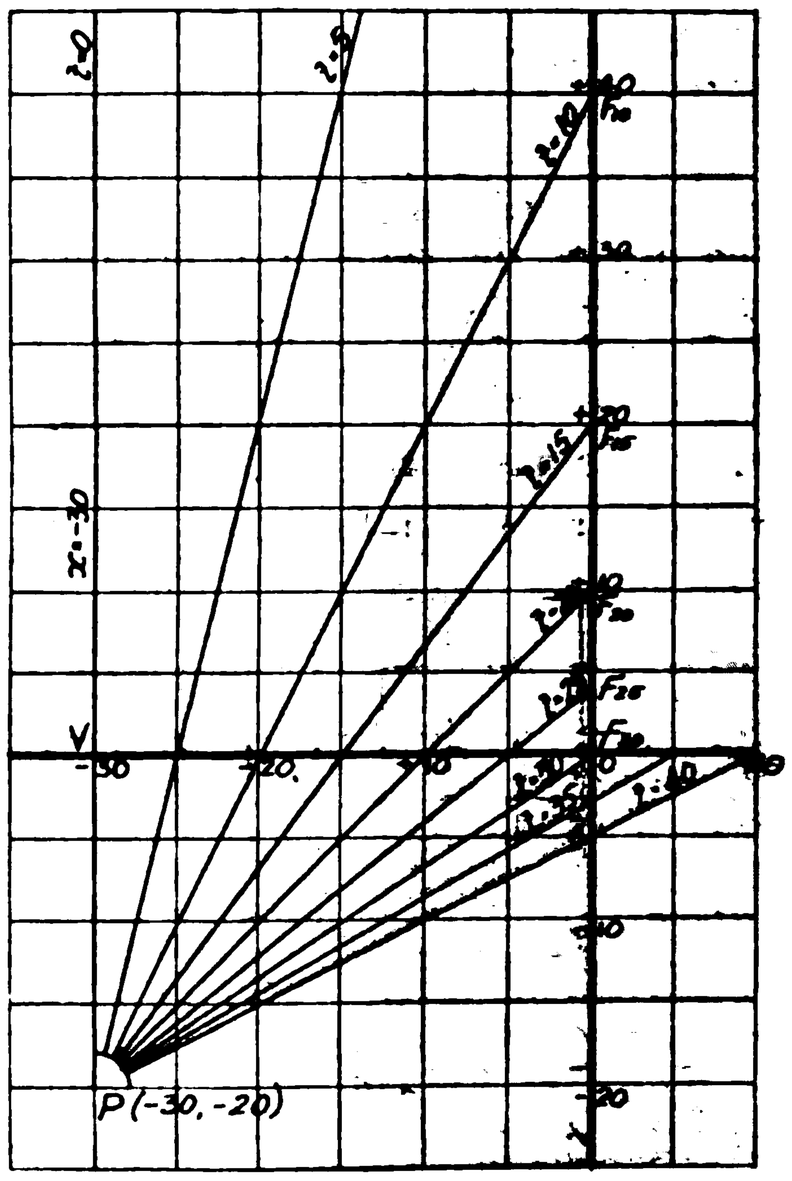
Hence $f_1 = +20$, $f'_1 = +30$, $f'_2 = -15$, $f_2 = -10$

The cursor is set at $P = (-15, -10)$ and at $-(f_1'-t) = -(30-t)$ on OX (fig. 23).

(*b*) $r_1 = -5$, $r_2 = +10$, $\mu = 1.5$.

Hence $f_1 = -10$, $f_1' = -15$, $f_2' = +30$, $f_2 = +20$, and the cursor is set at $P = (+30, +20)$ and at $-(f'-t) = -(-15-t) = 15+t$ on OX (fig. 24).

It will be seen from the figures that while



Equi-Curved Lens. Fig 26.

(a) $r_1 = +10$, $r_2 = -10$, $\mu = 1.5$.

for the positive meniscus f is positive for all values of t, this is not so in the case of the so-called negative meniscus. In the example given f is negative for the value $t=0$ to $t=15$, becoming infinite at the latter value, giving a telescopic system, the Steinheil Cone, while beyond $t=15$, f becomes positive.

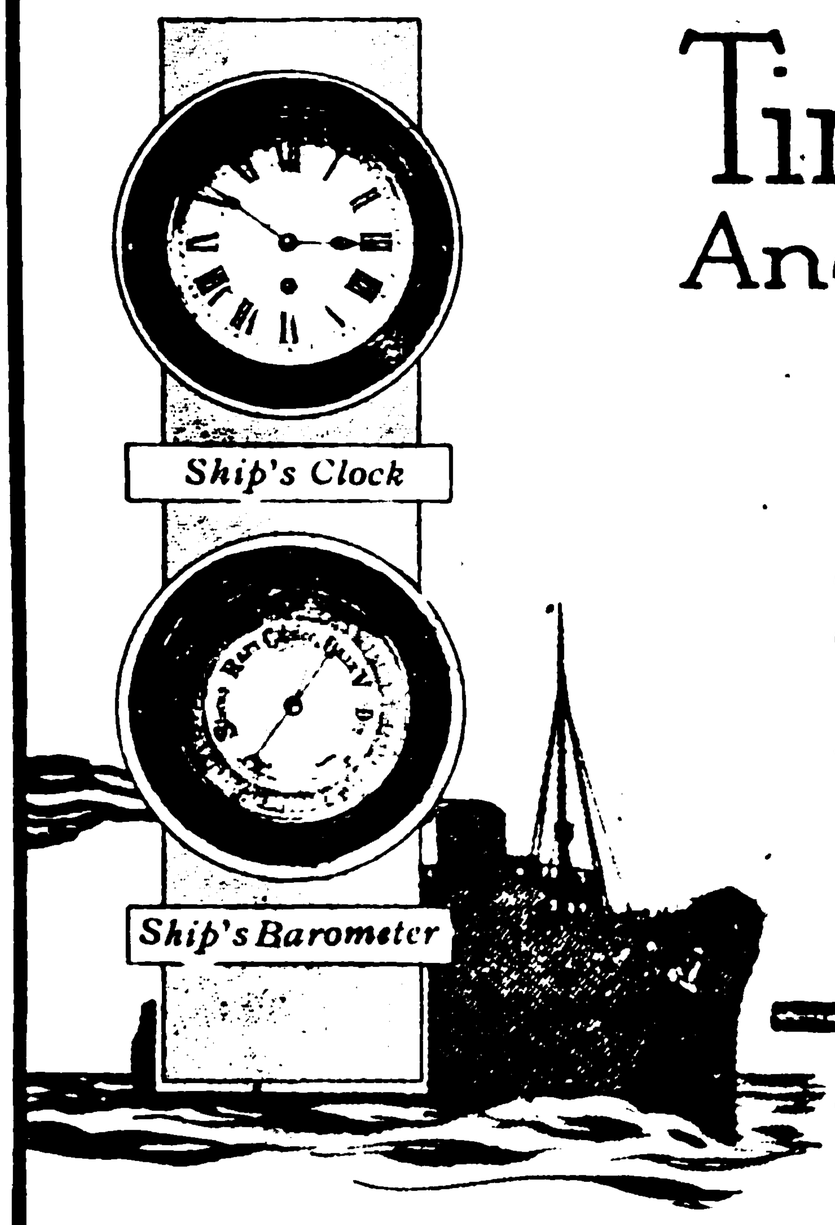
Another special case occurs when $t=5$ and the two centres of curvature coincide giving

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

T. A. R. & Co.

"THE ALL BRITISH HOUSE."

Over 2,000 Designs in Aneroid Barometers.



Time and Tide
And Ship's Instruments



T.A.REYNOLDS & Co
40-1-2 PERCIVAL STREET,
LONDON E.C.1



Steam-pipe Thermometer *Hydrometer*

Telegrams—
"THERBAROME. LONDON."

Telephone—
339 CITY.

Showrooms and Offices at above address.

If you are a Retailer and need ORIGINAL LINES in Barometers, Clocks and Thermometers, write us, and although we will not supply you direct, we will put you in touch with the Nearest Wholesale House.

WHOLESALE AND SHIPPING TRADE ONLY.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY



Finger Piece Supremacy

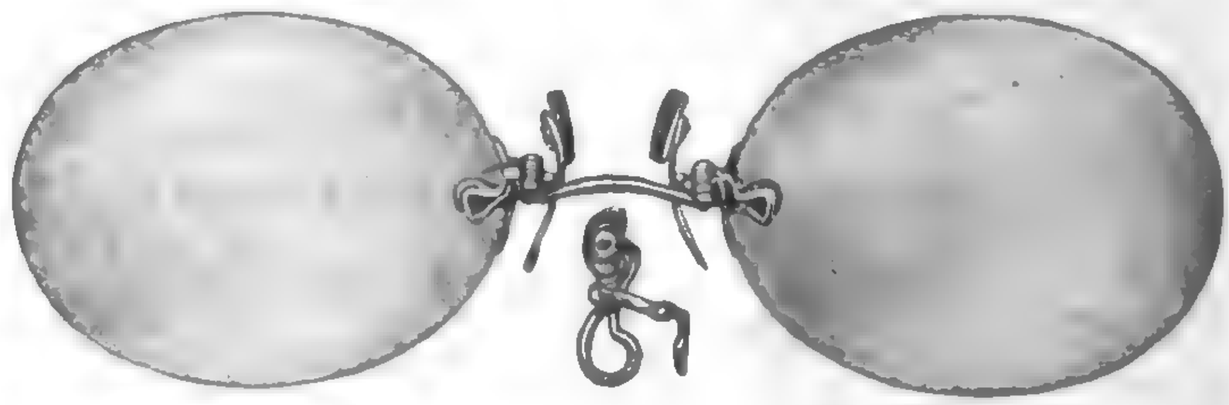
Finger piece Mountings and Frames have always been our specialty. Our original Finger piece line, which we named **Realfit,** became so popular with the optical trade that we recently adopted the name **Realfit** for all our products.

No finger piece mounting on the market gives longer wear or greater satisfaction.

Made in 1/10-12 ct gold filled also 10 and 14 ct. solid gold. The mounting is constructed with jeweler's precision to afford the utmost comfort, beauty and durability.

Made in all standard sizes with a complete assortment of guards. Your wholesaler can supply you with **Realfit Products.**

REALFIT *Finger Piece.*



NEW JERSEY OPTICAL Co.,
Newark, N.J., U.S.A.

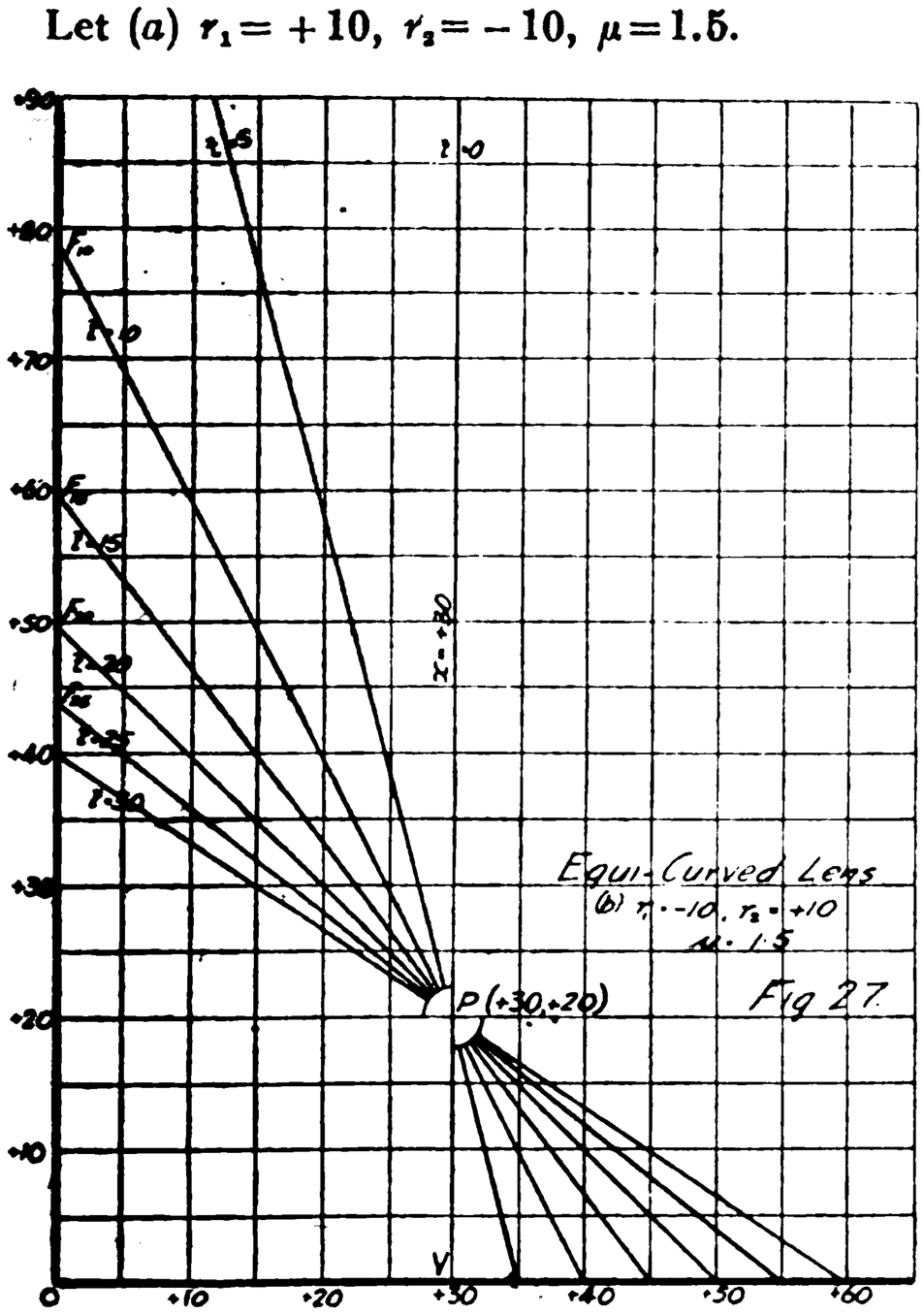
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

the Concentric Lens. From the figures it will be seen that one is -10 from the convex surface and the other $+5$ from the concave surface. The principal points, therefore, coincide at the common centre of curvature.

(7) *Equi-curved or Null Lens.*

In this case the radii are equal but of opposite sign.

Let (*a*) $r_1 = +10$, $r_2 = -10$, $\mu = 1.5$.



Giving $f_1 = +20$, $f'_1 = +30$, $f'_2 = -30$, $f_2 = -20$

and (*b*) $r_1 = -10$, $r_2 = +10$, $\mu = 1.5$

Giving $f_1 = -20$, $f_1' = -30$. $f_2' = +30$, $f_2 = -20$

It will be seen from figs. 26 and 27 that this case is very similar to that of the Unofocal Photographic Lens (figs. 12 and 13). f is positive for all values of t and the principal planes lie on the convex side of the lens at a constant distance of 20 from their respective faces, and, therefore, separated by a distance equal to the thickness of the lens.

In the general case of a thick lens bounded by different media, the Nodal and Principal Points no longer coincide. The principal points can be determined, as in the previous example, from focal lengths of the two surfaces, while the nodal points can be determined from the fact that they are now displaced from the principal points towards the denser external medium by an amount equal to the difference of the focal lengths.

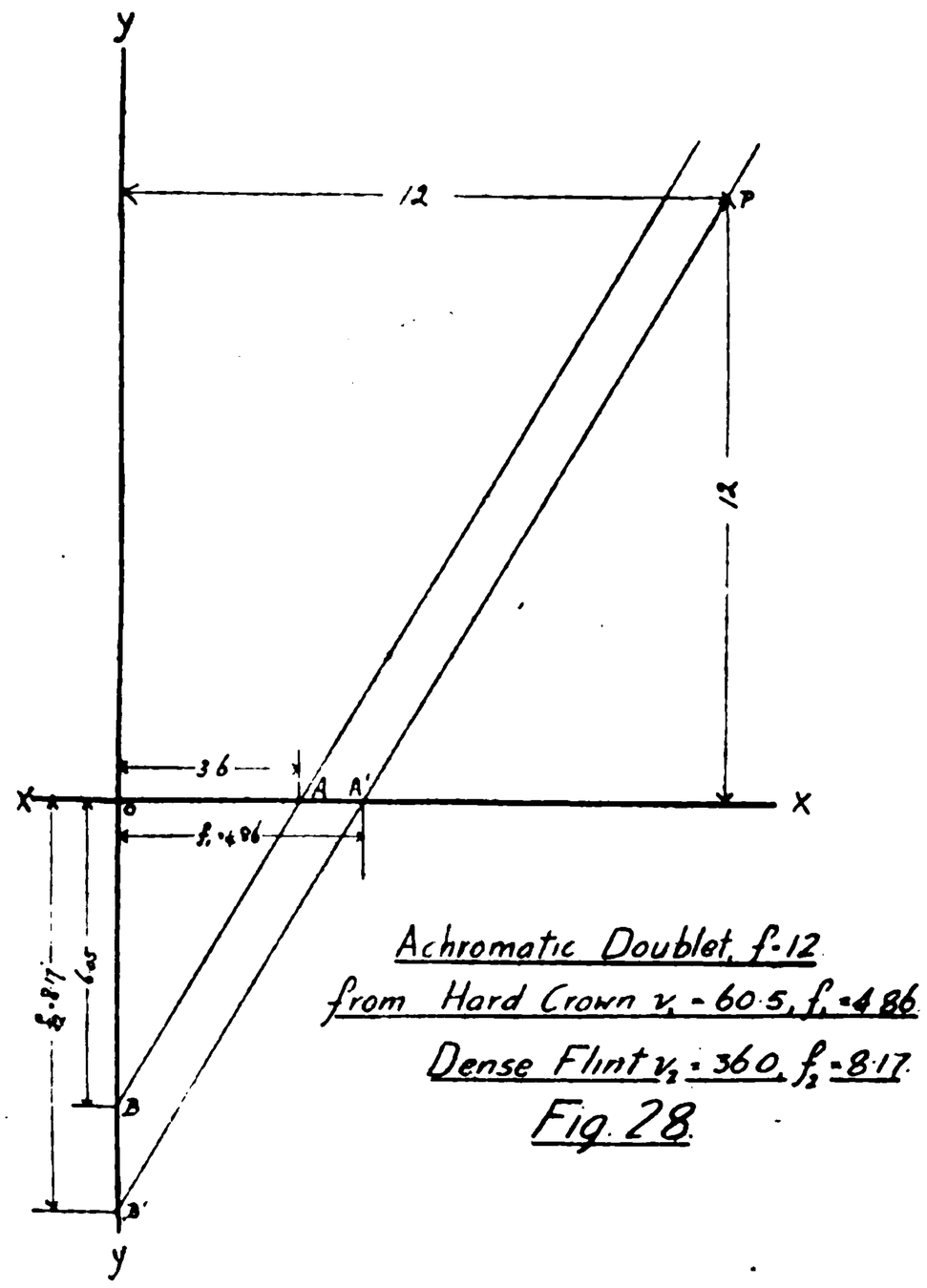
VII.—*Calculation of an Achromatic Doublet.*

This may be readily carried out by making use of the relation.

$$\frac{f_1}{f_2} = -\frac{\omega_1}{\omega_2} = -\frac{\nu_2}{\nu_1} \quad \ldots \quad \ldots \quad \ldots \quad (15)$$

where f_1 and f_2 are the focal lengths of the component lenses; ω_1 and ω_2, their dispersive powers; ν_1 and ν_2, the reciprocals of the latter, their efficiencies or achromatic refractivities.

To calculate the focal lengths of the lenses which are required to produce a combination of given focal length we merely set off along the axes, lengths proportional to the given dispersive powers or efficiencies, place the cursor in this position and move it parallel to itself until it passes through the pole corresponding to the required focal length. The intercepts on the two axes will then give the focal lengths of the components. Fig. 28 shows the method



for an achromatic lens of focal length 12, made from Hard Crown $\nu_1 = 60.5$, and Dense Flint $\nu_2 = 36.0$.

The cursor is set at A and B, where $OA = 3.6$, and $OB = 6.05$. It is then moved to the parallel position $A'B'$ in which it passes through $P = (12, 12)$. The intercepts $OA' = 4.86$

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

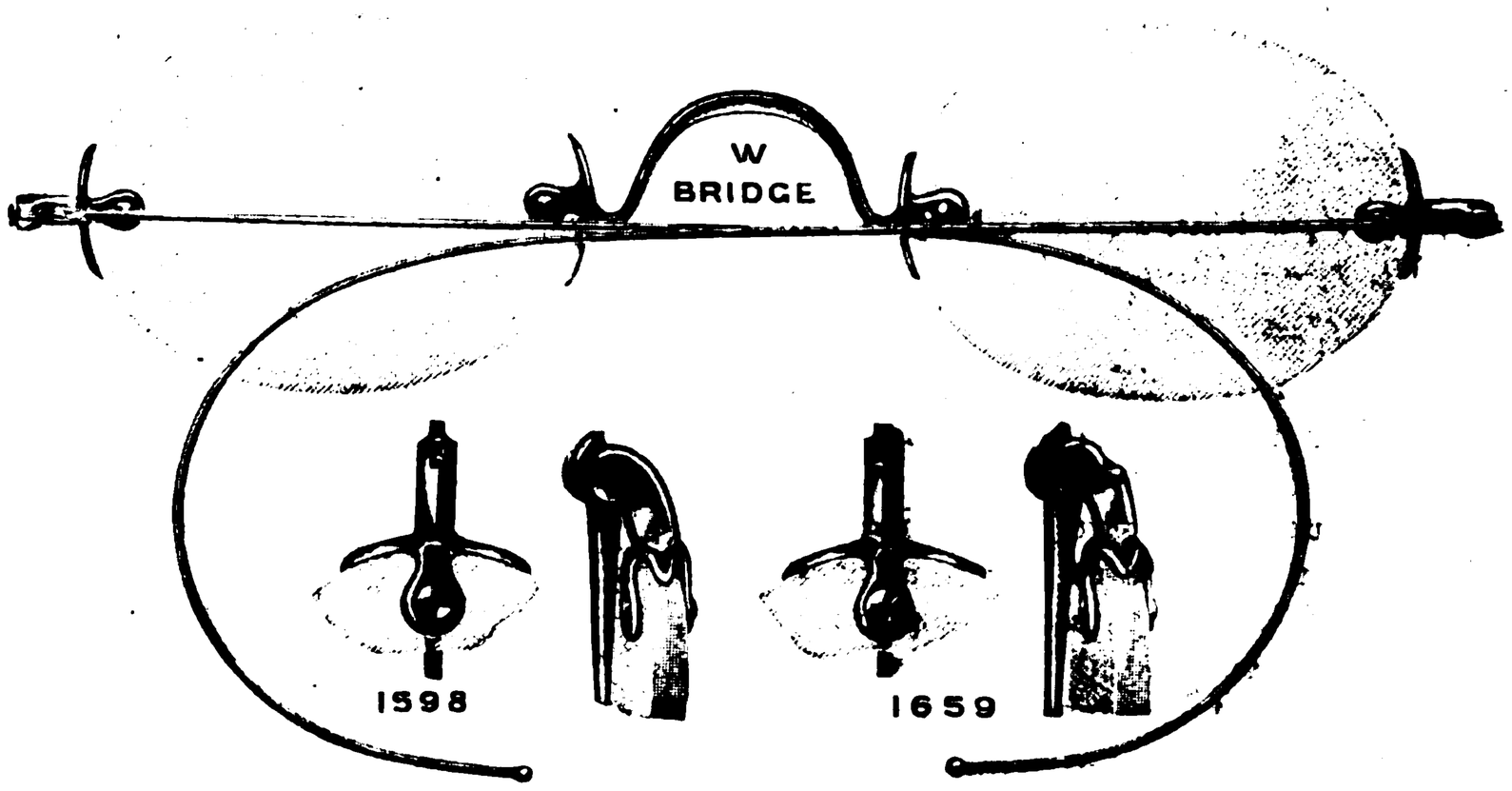
QUALITY FIRST

DUPAUL, YOUNG OPTICAL CO.,

ESTABLISHED 1888.

SOUTHBRIDGE, MASS., U.S.A.

Manufacture only Guaranteed Quality and Best Finish Gold-Filled and White Metal Spectacles, Eyeglass Frames, Astigs, Mountings and Materials.



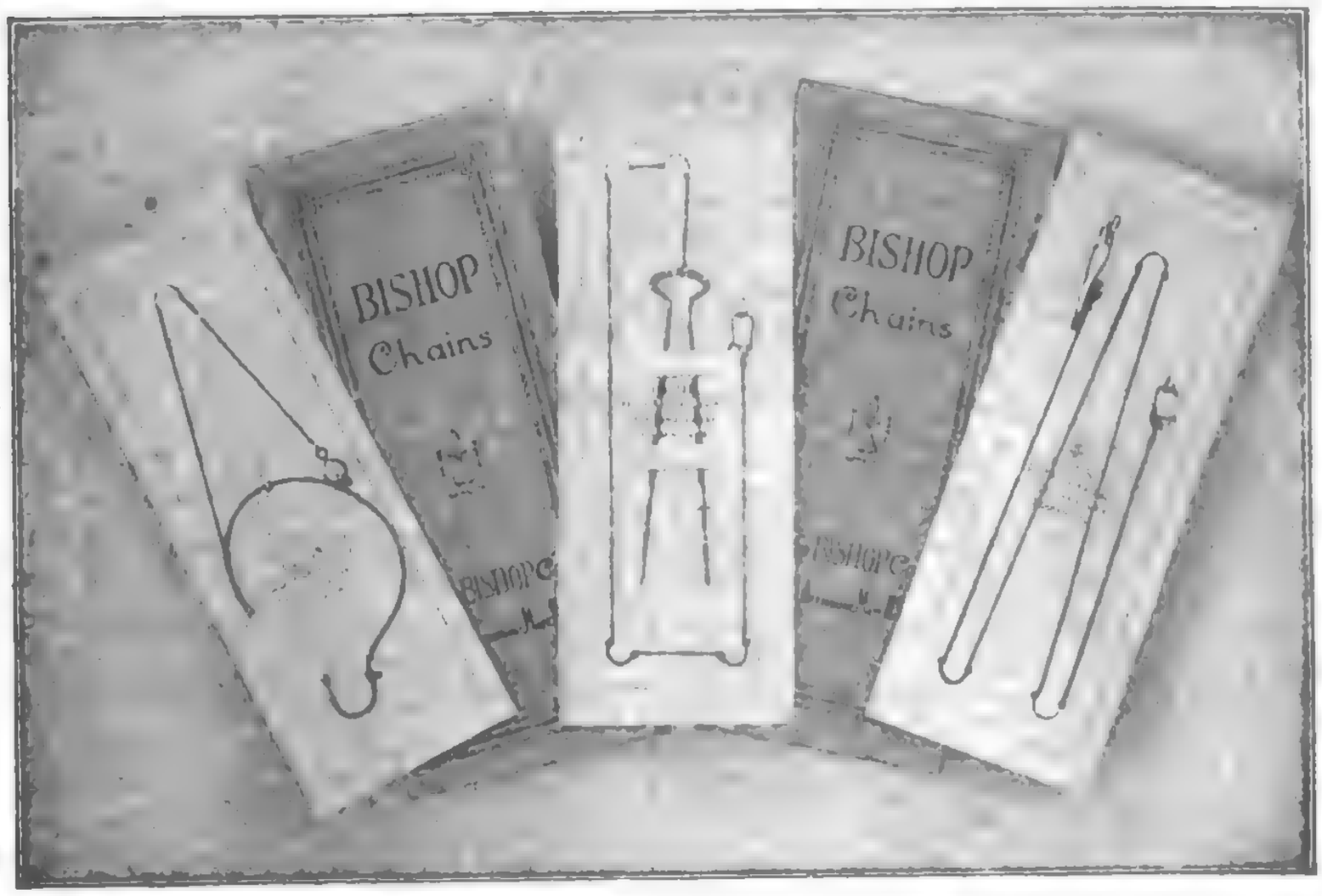
To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. Telephone: CENTRAL 7241

Digitized by Google

Original from THE OHIO STATE UNIVERSITY





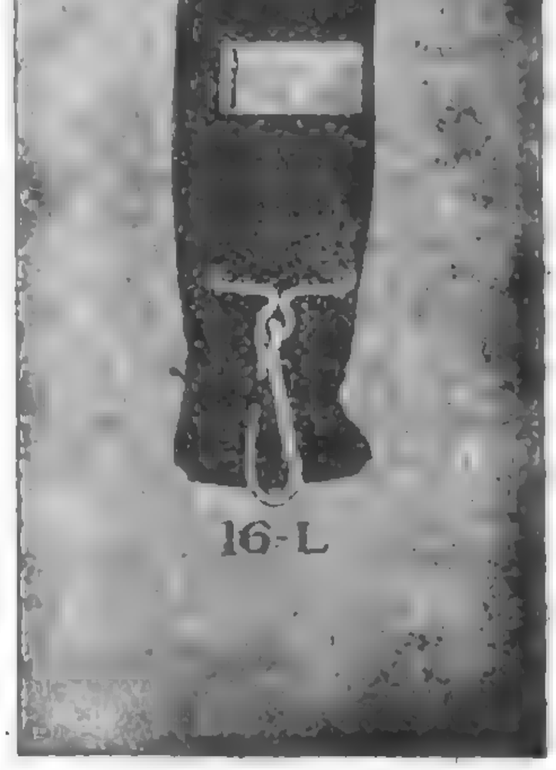
BISHOP CHAINS

should be your standard of Quality,
in solid Gold and Gold Filled,

BISHOP SILK EYEGLASS CORDS AND MONOCLE RIBBONS.

With Gold Filled, Silver or Gun Metal snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.



To be obtained from all Wholesale Optical Houses.

LONDON OFFICE **S. PULZER,** 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. Telephone: CENTRAL 7241.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

$OB' = -8.17$, gives the values of the focal lengths, f_1, f_2, of the crown and flint components respectively. It will be noted that by interchanging the lengths set off along the axes we get the focal lengths of the components of an achromatic lens of the same focal length but of opposite sign, viz., -12.

In conclusion, I wish to thank one of my colleagues, Mr. E. E. Haley, for his kindness in making the diagrams and Mr. H. S. Durrans, Assistant in the Physical Laboratory, for checking the results.

HYPERPHORIA.

One of the advantages of frequent conversations with one's colleagues on matters of ocular practices and methods is the inevitable occurrence of some remark which causes the listener to refresh his memory on such topics at a later date or which presents to him evidence that certain tests ought always to be made when particular data exist and thereby directs the attention to possible omissions in his routine of examination. Such an occasion arose recently in our own experience, for in the course of a conversation which we had with a keen and painstaking student of all points relative to ocular refraction he made the statement that he always took the binocular fixation fields in any case showing an apparent vertical imbalance for the reason that he often found paresis and was thereby enabled to properly prescribe a prism instead of dividing the prism between the two eyes or placing it in the opposite direction before the other eye.

The facts presented were not new, and yet we are wondering: How many take the binocular fixation fields in every case showing a vertical imbalance? We confess that we have not done so, nor have we in most cases taken the versions by any method which might be considered especially trustworthy. It is, in passing, a question in our own mind as to whether or not it is proper practice to put the whole of the prism prescribed before the paretic eye, but it is obviously improper, so we believe, to place it before the eye the vertical recti of which are not abnormal in their actions. These remarks we hope will induce readers to make a careful study in their own practices as to the advisibility of including as a part of the tests in all cases showing a vertical imbalance of one or more degrees the matter of the taking of the binocular fixation fields.

As is well-known, hyperphoria is a tendency of one visual line to exist above that of the other. Such a condition is fairly frequent and if it is of low amount it may not interfere with health or with the comfort of the eyes. Hansell and Reber ('Ocular Muscles') state that 20 per cent. of several hundred consecutive cases showed a hyperphoria of one-half degree or more. Other data given by Carpenter, Posey, Bannister, Howe and Williams indicate that about "one in ten of all patients who are the subjects of muscular or accommodative asthenopia will during the preliminary examination display some degree of vertical imbalance, either alone or associated with esophoria or exophoria."

Certainly the degree of the hyperphoria, *per se*, is of no significance as to the possible reflexes or derangements which may be produced, any more so than is the case with the amount of the astigmia, for instance. Those having small amounts of hyperphoria and who are engaged in close work may have to abandon such work because of very small errors, whereas a person having a larger amount but leading an out-of-door life and possessed of a rugged constitution may carry several degrees of hyperphoria without any apparent discomfort.

To be sure, spurious hyperphoria is to be carefully guarded against, particularly in the matter of decentration of lenses and malfunctions of eyes with reference to test lenses either as used in the trial-frame or in the phoro-optometer. Especially is this true in cases of more than the ordinary corrections; for a 4 D.S. decentered two and one-half millimeters will thereby introduce one prism-dioptry. Likewise, it is possible that the hyperphoria is concomitant with a condition of esophoria, for example, in a case of hyperopia, simple or compound; in which case the relief of the hyperopic condition may remedy the esophoria and also largely, if not wholly, remove the hyperphoria.

The symptoms of hyperphoria cannot be said to be characteristic of this condition only. There may be included, however, the following: (1) Chronic hyperæmia of the lids, (2) epiphora, which is generally unilateral, (3) defective vision, for the hyperphoric eye may not be raised by any lenses to normal, (4) confusion of images, especially when, after monocular tests, the two eyes are allowed to work

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Shur-on Glasses

Look for this Trade Mark

Shur-on

High grade, standard products of every kind are naturally subjected to imitation.

To be sure of getting *the* optical products, which, for well upwards of half a century, have been universally known and worn because of their "Quality Beyond Question"—look for the trade mark, "Shur-on." It is your protection against inferior imitations.

If your wholesaler cannot supply you, write us mentioning his name.



New!

An All Shelltex frame with rivetless front and almost invisible hinge *anchored* in the heart of both the temple and the frame, where it resists the strain and stress of wear and tear, thus ensuring long-lasting satisfaction. A real masterpiece!

Shur-on Optical Co.,

Rochester,

New York, U.S.A.

Quality Beyond Question Since 1864

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

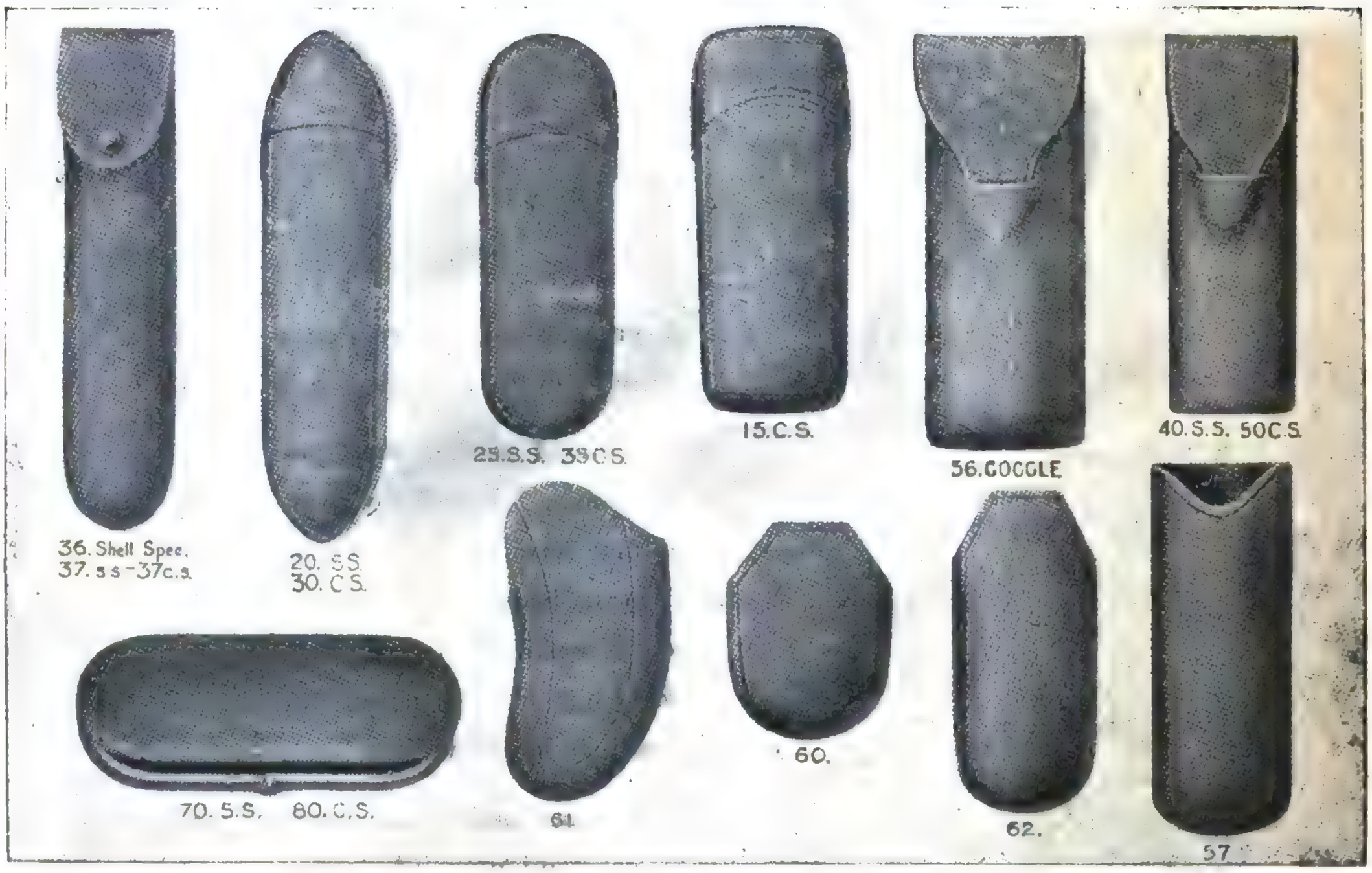
WHOLESALE TRADE ONLY.

W. Smythe & Co. Ltd.

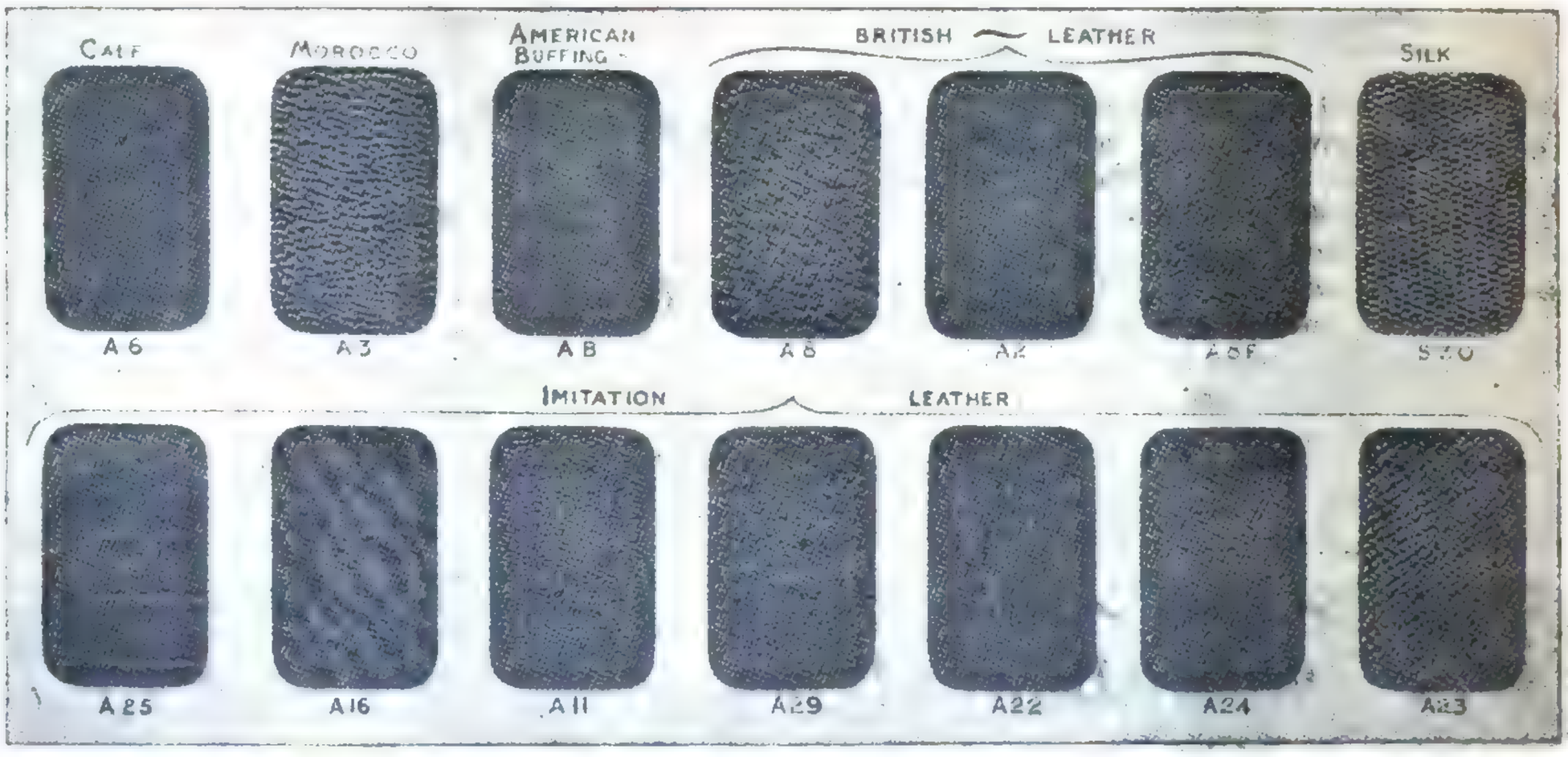
Head Office: 66 and 67, EDWARD ST. PARADE, **Birmingham**

Branch Works—HOCKLEY AND WALSALL.

Patent Optical Case Manufacturers



All Our Goods can be Covered with These Materials and Velvet.



Illustrations Half-size. Competitive Prices

Also Makers of Patent Spring Lid Cases "NOWATE" Write for List and Prices.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

together, (5) binocular vision may be less than the better monocular vision, (6) the characteristic turning of the head, to avoid the error, and (7) occasional peculiar facial expression, especially the furrows above one eye or the raising of one eyebrow higher than the other. Furthermore, it may be pointed out that symptoms of vertical imbalances include painful eyes, drowsiness from long-continued near work and sensitiveness to light.

Detection of Hyperphoria.

The presence or absence of hyperphoria should not be based upon one test alone; in fact, it is never safe to depend solely upon any one method in the practice of any science. There should always be a system of checks. This is especially true in the case of hyperphoria, *i.e.*, vertical imbalances.

The commonest method of testing for such imbalances is the use of the Maddox rod, the head being in the primary position. The test light should not be high or low as we so often find it, but as nearly in the primary position as possible. The imbalances indicated should be the same when the Maddox rod is placed before either eye and also when it is turned over; if not there is evidence of a slight paresis of one of the elevators or depressors or again the Maddox rod may be imperfect. Incidentally, every practitioner should take occasion to check his apparatus and find out its degree of perfection.

One should always be on his guard against the possibility of the fusion of the streak and light and we believe that two simple check methods exist: Firstly, to use the simple cover test in conjunction with the Maddox rod test, for immediately upon uncovering one eye and getting the answer as to the relative positions of streak and light, the operator is enabled to determine whether the full latency of imbalance has been disclosed. Secondly, to use such an amount of prism, base in, as to produce diplopia and to then determine when the two lights—one of which may be made to appear red through the use of a red disc—are in a horizontal plane. The parallax method when used under proper conditions and surroundings is capable of giving reliable results and of disclosing latencies, and is susceptible of such delicacy of application that, as Duane claims, as low as a quarter degree of hyperphoria may be disclosed.

The question often arises as to whether or not the ametropic corrections should be worn during all tests. If one test only is possible, and all spurious effects from tilting of head, improperly placed lenses, and so forth, are guarded against, the tests should be made while the corrections are worn. But we feel that tests with and without corrections should be made since, for example, an esophoria accompanied by a hyperphoria may be diminished or removed by the application of lenses correcting the ametropia and through this reduce the hyperphoric condition also. And again, we have found conditions of hyperphoria of small amount to arise with corrections present, when such vertical imbalances did not exist when the naked eyes were tested, due care being exercised to avoid improper testing.

The duction tests at distance, *i.e.*, 20 or more feet, as measured by means of prisms base up and down applied until diplopia ensues, should be the next step in the examination, we believe. We thereby obtain the superduction and the infraduction of each eye. Normally these are of the value of two to three prism diopters. Generally speaking, the superduction and infraduction should be equal. A difference of a degree or more in these ductions on the same eye indicates a probable hyperphoria. If the Maddox rod or other test has indicated a hyperphoria and the duction tests give differences in the prism power of upward and downward fusion, we may feel certain of a condition of hyperphoria. Some one has remarked that a superduction of over 3 degrees is suspicious of hyperphoria, but many will not be willing to accede to this statement.

In cases in which the superduction and infraduction as found by prism tests are equal and yet where hyperphoria is suspected it may be advisable to get the fields of monocular fixation, particularly the upward and downward excursions. In all such tests the head should be rigidly held and the test-object followed by the eye. Hansell and Reber suggest the use of a small card carrying a black dot which is to be carried as far up and as far down the arc of a perimeter as the eye will follow it without wavering or receiving a blurred image of the object. The other eye is to be occluded as in ordinary perimetry.

Use of Retinoscope Lamp.

A modification of this test is to use a small electric retinoscopic or ophthalmoscopic lamp, the head of the instrument being removed before use. As a general rule this examination should show at best 35 to 40 degrees of upward and from 50 to 55 degrees of downward excursion. If the upward or downward rotation is insufficient, the deviation is due to weakness or to paresis of one or more of the vertical recti. In this case diplopia can be ob-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

tained when the eyes are twenty or more degrees from the primary position. The diplopia will, of course, increase as the test-object is carried in the direction of the weak muscle or muscles.

The binocular fixation fields are readily obtainable and much information of value may be thus often secured by a search of the extreme peripheral portions of these fields. A small electric lamp may be used in an otherwise darkened room, the person under test wearing a red or other coloured glass before one eye. A hand perimeter may be used to advantage in these examinations. The existence of binocular single vision in all quadrants or portions of the test light with the arc of the perimeter set at various angles, indicates that there is no paresis of any of the elevating or depressing muscles. Should there be a lateral diplopia and the two lights remain in the same relative positions with reference to a horizontal plane in all quadrants of the test, the examiner is then assured of the fact that no vertical imbalances are associated with the lateral condition and that there is no paresis of the vertical recti.

Without the use of a perimetric arc the binocular fixation fields should be tested in nine positions: three in the plane of the primary fixation, including straight away fixation and to the right and to the left thereof; three similar tests in such positions as to involve the elevators and again three tests involving the depressors. In this manner hyperphoria and hypophoria may be differentiated. For instance, in a case showing a few degrees of left hyperphoria or right hypophoria at both distant and near points, it is possible that a search for diplopia in the extreme peripheral portions of the binocular fixation fields will show vertical diplopia with the right image *higher* in the middle and right upper fields, being most marked in the right upper field. According to the laws of projection, therefore, there is evidence that there is a paresis of the right superior rectus. Hence this condition of *left hyperphoria* is properly diagnosed as one of *paretic right hypophoria.*

Simple tests for vertical imbalance at the ordinary reading points include the Graefe's dot and line test with the use of the Maddox double prism or the small electric lamp and the Maddox rod test when used in conjunction with the cover test.

The above interesting article is quoted from the 'American Journal of Physiological Optics,' edited by Dr. Charles Sheard, and published by the Research Division of the American Optical Company.

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

Early Sight Testing.

Sir,—I have read with much interest your editorial note, also the attendant correspondence in your columns with reference to the various points on early sight-testing.

My own experience might be of a little interest as showing the state of the optical industry in the year 1868.

At that time I had just finished my apprenticeship of seven years with the oldest firm of opticians in Scotland, viz., Messrs. Gardner & Co., Opticians to H.M. The Queen. In those days all spectacle glazing was done by hand and every apprentice had to go through this part of his training although his ultimate aim might be the sight-testing room. The glazing consisted entirely of spherical lenses, as cylinders and prisms had not been heard of.

Mr. Gardner, as head of the firm, did most of the sight-testing, and in cases where he could not improve the vision to the extent he would have liked he invariably enquired if the patient was addicted to tobacco or snuff. If the answer was in the affirmative he told them most emphatically that they must stop indulging in either of these habits for at least one month, and at the end of this time their eyes might be in a condition to be properly tested. In some of these cases this treatment may have been justified, but the inability to get proper vision may have been due to a very great astigmatic error. As, of course, cylinders were not used, no other remedy was to hand to the sight-testing optician.

After leaving Messrs. Gardner & Co., I went to Mr. Patrick Adie, an instrument maker in Pall Mall, and being much interested in optics became acquainted with several of the larger opticians in London, and especially with Messrs. Horne & Thornthwaite, of 122 & 123, Newgate Street, E.C. At this time they were, if not the leading firm in the sight-testing branch of the trade, at least, one in the very front line.

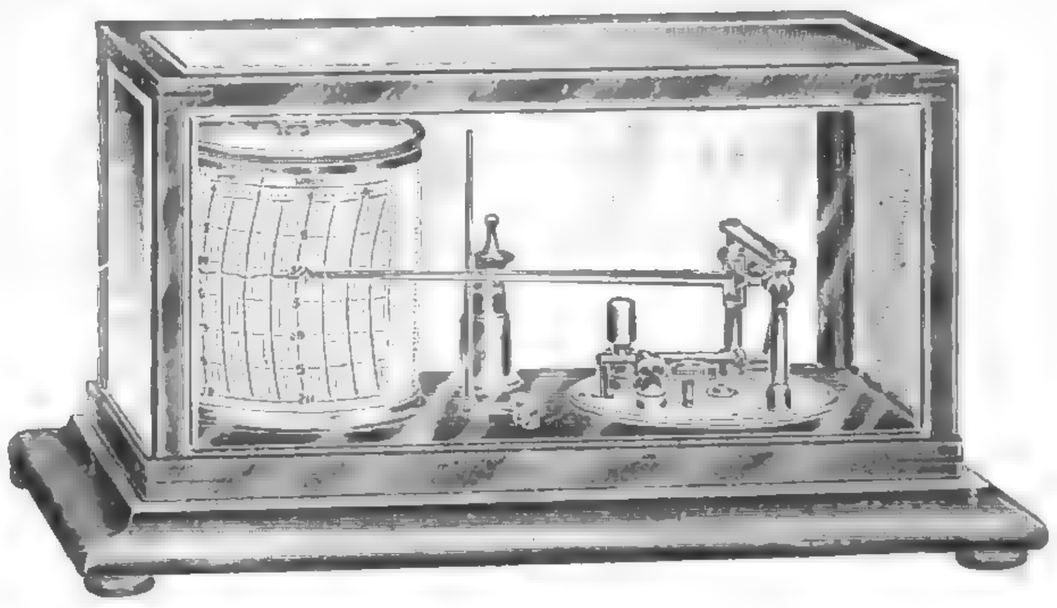
I have in my possession a pamphlet en-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

A POPULAR BARAGRAPH

of S. & M. Quality.

This first-class Recording Barometer combines an unusually high degree of accuracy with very moderate price. The Vacuum movement is concealed beneath the base plate, the whole construction being typically "S. & M." in simplicity and reliability. Available for prompt delivery, either in oak or mahogany case with glass cover, eight day clock and one year's supply of ink and charts.

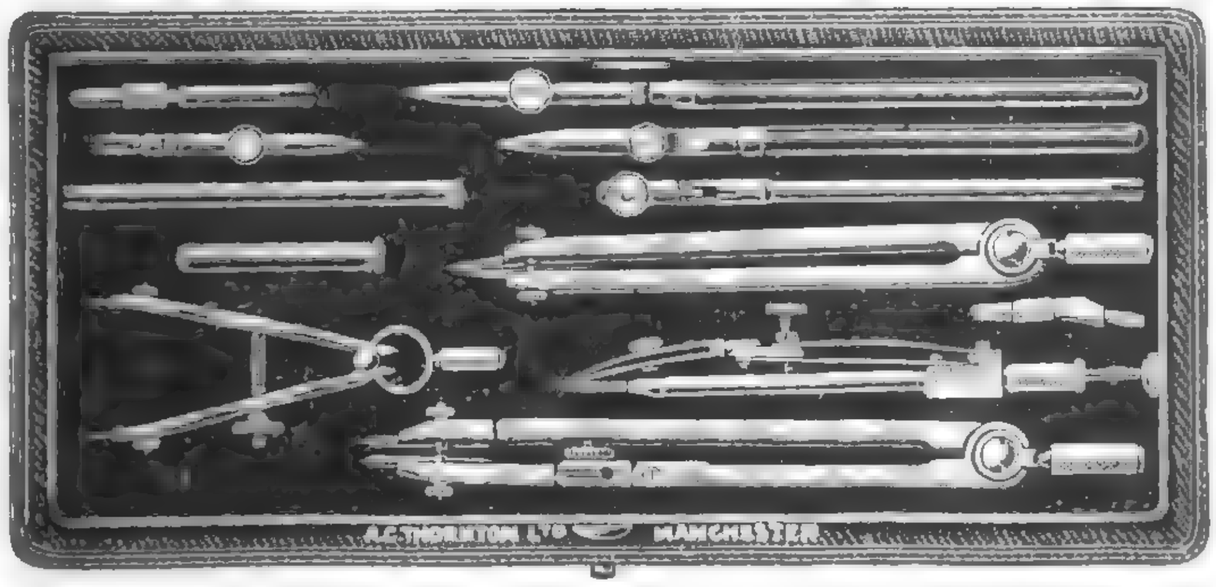


The world-wide reputation of "S. & M." Scientific Instruments entails no penalty to the Retailer. Every sale shows a handsome profit.

Write for full particulars, terms and general booklet.

SHORT & MASON, Ltd., Aneroid Works, Walthamstow, London, E.17

BRITISH MADE DRAWING INSTRUMENTS



Pocket case of Show Instruments, from 18/9 each.

SPECIAL TERMS TO THE TRADE.

Produced in our Fa ctory at Manchester.

A. G. THORNTON, LTD.

Contractors to the British, Colonial, and other Governments.

PARAGON WORKS, 20, KING ST., WEST, MANCHESTER.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"You Cannot TRADE SQ MARK *Buy Better"*

STEVENS' QUALITY Optical Goods

UNQUALIFIED approval meets this celebrated line wherever introduced.

WE are sole agents for the United Kingdom and can invariably supply your requirements from stock.

One Quality Only—The Best Made

1/10th 12ct. Gold Filled

Specialising in the Fingerpiece Mount

Send us your enquiries for
Spectacles and Eyeglasses—Frames and Mountings

Complete Catalogues on Application

H. WILLIAMSON Ltd.

Optical Section

87/89 GREAT SAFFRON HILL, LONDON, E.C.1

General Optical Supplies—Prescription and Repair Work—
Fittings and Instruments—Optical Machinery

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

titled "Hints on Spectacles," published in 1870 by them. This pamphlet was compiled by Dr. Ackland, who did the sight-testing at Messrs. Horne & Thornthwaite's.

In his pamphlet, Dr. Ackland states that for the last 18 years he had made the prescribing of spectacles his special study, and, further, that in March of the year 1870 he attended Netherlands Ophthalmic Hospital at Utrecht where the subject was so ably treated by Doctors Donders and Snellen, from both of whom he received very special and minute instruction in theory and the practice of same in hospital, with the result that on his return to London he was able to overcome difficulties that had previously been almost insurmountable.

On re-reading this pamphlet I find Dr. Ackland touches on almost all the points that are covered to-day by our newer and more up-to-date text books. There is even a mention made of cylinders, although nothing very definite is given in the statement regarding their use.

JAMES MUIR.

6, Radnor Terrace, Glasgow, W.

Sir,—I passed my examination in Calcutta in 1879, and returned to England in 1884 and commenced business as an optician by taking 14 consulting rooms in Oxfordshire, Bucks, Herts, and Northamptonshire, and advertising in the local papers of each town to personally attend twice monthly, alternate Mondays, Tuesdays, and so on, and in every case I tested both the refraction and astigmatism, and never under any circumstances did I supply a ready-made pair of glasses. In 1886, I invented and registered in Stationers' Hall my refraction and astigmatic chart.

Finding the expense of advertising weekly in about 30 to 35 newspapers and 14 rents for my consulting rooms too much for me, I was forced to visit and advertise in one town for several weeks; also to drive round the surrounding counties, but I never attended one without my fully equipped trial case which I now have, and so I travelled over the whole of England. I, therefore, think I may justly claim to having been the first to advance sight-testing and making glasses to prescription; and I can assure you it was a most difficult matter, as people in those days had no knowledge of the sight and it was not easy to make them understand that both eyes were not alike, and that spectacles should be made to their prescription and to suit the sight of each eye. As to astigmatism, people were still more difficult, and even very many medical men were surprised at my results, as my numerous testimonials of that date would prove. My business is still and always has been travelling, though I have had town shops. The late Mr. Aitchison was the real pioneer of the "Eyesight Testing" business as now carried on, but I was the first to introduce the interchangeable lenses and frames, which were made to my order in 1886, by the firm of Osmond, Davis & Sons, of Great Hampton Row, Birmingham.

I hope you will be good enough to publish this letter, as the travelling optician is so often referred to as the quack.

G. BRAHAM.

167, The Grove, Hammersmith, W.6.

The Spectaclemakers Company

51st Examination, November 1921.

Questions in General and Practical Optics.

Not more than EIGHT to be answered.

Time allowed 3 hours.

1. Find the diameter of the umbra and penumbra of the earth at the distance of the moon (240,000 miles) taking the earth's diameter as 8,000 miles, and the visual angle subtended by the sun from the earth as 32 minutes.

2. A kaleidoscope is made with three plane mirrors each $2\frac{1}{2}$ inches wide, and a small square object is viewed by it. Draw a diagram showing the appearance which would be seen.

3. A railway carriage 8ft. x 6ft. and 7ft. 6in, high is lit by a single 50 c.p. lamp in the centre of the roof. What is the illumination on a horizontal surface in the corner 2ft. 6ins. from the floor?

4. Sketch and describe the construction of some good form of lens measurer.

5. A lens measurer having a span between its outer points of $\frac{3}{4}$in., and with its scale marked in diopters for a refractive index of 1.53, reads zero when applied to an optically plane surface. On inserting a small microscope cover glass between the surface and the centre point, a reading of +2.5D. was obtained. What was the thickness of the cover glass?

6. How is a Nicol prism constructed and what are its properties?

7. An equilateral right angled prism is placed on a table with its faces vertical, and a

Digitized by Google Original from THE OHIO STATE UNIVERSITY

horizontal parallel beam of light falls on its hypothenuse at an angle of 20° to the normal. Trace the course of the beam.

8. Describe the various types of bifocal lenses, and state the advantages and disadvantages of each.

9. **A toric lens has the formula**

$$\frac{+6\text{D Cy. at } 180^\circ \frown +7.5\text{D Cy. at } 90^\circ.}{-2.5\text{D Sph.}}$$

How can a prismatic effect of 2.5 prism dioptres, base in, be obtained with this lens?

10. Describe with sketches some good form of achromatic magnifying glass.

11. A long tank filled with water of refractive index 1.333 has an equiconvex lens of refractive index 1.58, thickness $\frac{3}{4}$in., and each surface having a radius of curvature of 2 inches, fitted in one end. Find the position of the principal, focal, and symmetrical planes, and of the nodal points.

12. What is ultra-violet light? Mention some substances which are very transparent and very opaque to this light, and state for what purpose they are employed.

The Motor Exhibition.

Internal combustion engines are of great and increasing interest to persons engaged in the light manufacturing industries; and many of the latest, most efficient types of small motors will be exhibited at the White City and Olympia from to-day until Saturday, next week. In the motor boat section, engines down to 2 h.p. will be shown. Prices of admission will be (from 10 a.m. until 9 p.m.):—November 4th, 5th, 9th, 12th, 2s. 6d.; November 7th, 8th, 10th, 11th, 5s. (tax exempt), which prices are inclusive to both the White City and Olympia and for free conveyance by private motor coach service between the two buildings.

Orbito Non-Pressure Glasses.

In the announcement published last week of the Optical Products Company (Worcester Street, Birmingham), it should have been stated that the British patent on this invention is numbered 21323.

New Company.

Walters (Opticians), Ltd. Private Company. Capital, £500 in £1 shares. To carry on the business of ophthalmic opticians, manufacturers of and dealers in eye-glasses, gold and silversmiths, etc. The subscribers (each with one share) are: R. G. Walters and Mrs. B. Stephens. The first directors are not named. Secretary: R. G. Walters. Registered Office: 3, Pembroke Terrace, Cardiff.

Recent Optical Patents.

Complete Specifications Published.

1920.

139771	Maschinenfabrik Augsberg Nurnberg Akt-Ges, Gyroscopic apparatus for use in steering vehicles.
143262	Western Electric Co., Ltd., Thermionic devices.
145138	Optische Anstalt Goerz Akt-Ges, Spectacle lenses.
145630	Ges. Fur Drahtlose Telegraphie, Thermionic tube electro-magnetic wave-amplifying arrangements.
145638	Marston & Smith, Kinematograph apparatus.
146143	Bassani, Photo-mechanical printing.
147486	Zeiss, Sighting devices for aircraft.
147936	Signal Ges., Submarine sound-producing devices.
147941.	Signal Ges., Subaqueous sound producers or receivers.
147947	Signal Ges., Receiving device for submarine sound signals with a receiving member abutting on the water and a detecting device.
157881	Etablissements Contmsouza, Safety-device for kinematograph apparatus.
160739	Christensen, Photographic reproduction by means of a phosphorescent medium.
167902	Laurance and Wood, Ophthalmoscopes.

"Bondwell" Football Club.

(C. W. DIXEY & SON.)

Although possessing an inferior record than Mildmay (so far unbeaten), the "Bees" put up an excellent fight in their home match at Lea Bridge Road on Saturday, October 29th, and scarcely deserved to lose by a margin of two goals. It was anybody's game until Mildmay scored their second goal midway through the second half, which was against the run of the play, as Bondwell, in spite of facing a strong wind, had quite held their own. Much of their forward and half-back play was the outcome of splendid combination, and had their finishing efforts been as effective as their midfield work, they must have scored more than one goal. From kick-off till the finish, there was intense enjoyment in this game, a game of football as it ought to be played, full of whole-hearted endeavour with flashes of cleverness which showed on every part of the field. Bondwell scarcely deserved defeat in a well-contested game. Result: Bondwell, 1; Mildmay, 3.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

F. H. C. Lyon,

Full Stocks :=

12 ct. 1/10th Cable & Straight Side Frames.

Solid Gold Cable Frames & Astigs.

American and English Cases.

Lenses Uncut and Edged.

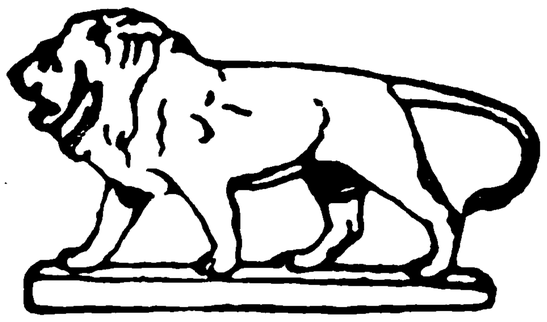
Samples and Prices on Application.

Rx Work a Speciality.

Wholesale & Manufacturing Optician,

59-61, Hatton Garden, London, E.C.1

Telegraphic Address :
CYLTORREXO, SMITH, LONDON.



Regd. Trade Mark.

Telephone No. :
HOLBORN 1203.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Manufacture Mécanique de Lunetterie & d'Optique

LIZON & Cie. at Morez du Jura — France. —

Formed by the amalgamation of the old firms:—HENRI COLIN FILS
ALPHONSE BUSSOD-ORY ANDRE CAMELIN LES FILS LOUIS LIZON
LOUIS ARBEZ GUY BUFFARD EMILE MANDRILLON

EYEGLASSES & SPECTACLES high-class goods in any metals and materials, any supplies for fitting and repairing spect. (straight and cable temples)

Clips, Rimless, Fits-u (Rivets, Screws, Crowns, Springs), D Eyes Spect. Frames with Collapsible and Folding Gauze Cups. Motor Goggles.

Optical Lens Manufacturers—Wholesale Only.

Candidates for the Examination of the **Worshipful Company of Spectaclemakers** can always be certain of receiving the most thorough and painstaking preparation at

THE SCHOOL OF OPTICS, LTD.,

Under the direction of Mr. LIONEL LAURANCE (Official instructor to the Company) and Mr. H. OSCAR WOOD.

General Optics, Visual Optics and Sight Testing.

The percentage of successful students AT THE FIRST ATTEMPT is consistently high.

Correspondence Courses, Afternoon and Continuous Day Classes.

Particulars on application to—

2, GUILFORD PLACE, LONDON, W.C.1

The Optician's Handbook.

Price 4s. 0d. Post Free.

An elementary text book required by every student of Optics.

It is an introduction to "The Study of the Refraction of the Eye, its Anomalies and their Estimation and Correction by means of Glasses.

The Hatton Press, Ltd.,

125, Fleet Street, LONDON, E.C.4

VISUAL OPTICS & SIGHT-TESTING

By LIONEL LAURANCE.

A New Edition, just out. Price 21s. 21s. 9d. post free.

GENERAL AND PRACTICAL OPTICS

By LIONEL LAURANCE.

A New Edition. Price 21s. 21s. 9d. post free.

The two ideal books for the acquirement of a knowledge of the subjects indicated by their titles.

THE HATTON PRESS, Ltd.,
125, Fleet Street, London, E.C.4

THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER

Subscription Form. **123-125, Fleet Street, London, E.C.4., England.**

Send a copy each week of THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER post free for which we enclose .....shillings for.....weeks.

UNITED KINGDOM 17s.
and ABROAD 20s.

Name.....
Business.....
Address.....
.....

A remittance of 17s. (or 20s. Abroad) for 52 issues includes "THE OPTICAL ALMANAC" post free.
Cheques made payable to The Hatton Press Ltd.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

GOLD FILLED & NICKEL GOODS

ALSO

UNCUT LENSES

AT ASTONISHINGLY LOW PRICES.

QUALITY AND FINISH GUARANTEED.

SEND FOR PRICE LIST.

OUR RX DEPARTMENT IS UNEQUALLED FOR PROMPTNESS & ACCURACY.

Telephone: HOLBORN 1629 (Private Exchange).

KIRK BROTHERS

WHOLESALE & MANUFACTURING OPTICIANS

Telegrams: KIRKROREX, HOLB. LONDON.

36, GRAY'S INN ROAD, LONDON, W.C.1

The Prefix is alright but what really counts is

THE SUFFIX

Crookes glass dates back to say 1913, and made by anyone is original and genuine, but it is important to remember that applies only to Sir Wm. Crookes A and B Glass. Since that date much water has flowed under London Bridge and Sir William only ceased his labours when he brought out his *Ultimate* Glass—the result of his long years of research. The only genuine Crookes Ultimate is made by—

SIR WILLIAM CROOKES ULTIMATE ANTI-GLARE GLASS CO., LTD.,

30, WIGMORE STREET, LONDON, W.

REMEMBER THE SUFFIX—ULTIMATE.

FINEST

ROUGH CYLINDER BLANKS,

Also good 2nd Selection

A very attractive proposition for Export and cheaper work.

CHANCE'S GLASS USED.

ACTUAL MANUFACTURERS

ASSOCIATED OPTICAL WORKS, Ld.

5, Queen's Buildings, London, W.1

Near Tottenham Court Road.

No Connection with any other Firm. Telephone: Museum 2216.

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,

DANDURAND BLDG., MONTREAL.

Cable "Optical" A.B.C. Code 5th. Edition.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

In view of the Editorial Notes *re* British Manufacturers Prices, We as Manufacturers think it opportune to say, we have **no Desire or Intention of "INCREASING OUR PRICES."**

We laid down a plant to deal exclusively with the production of

PLUS ROUGH TORIC CYLINDERS

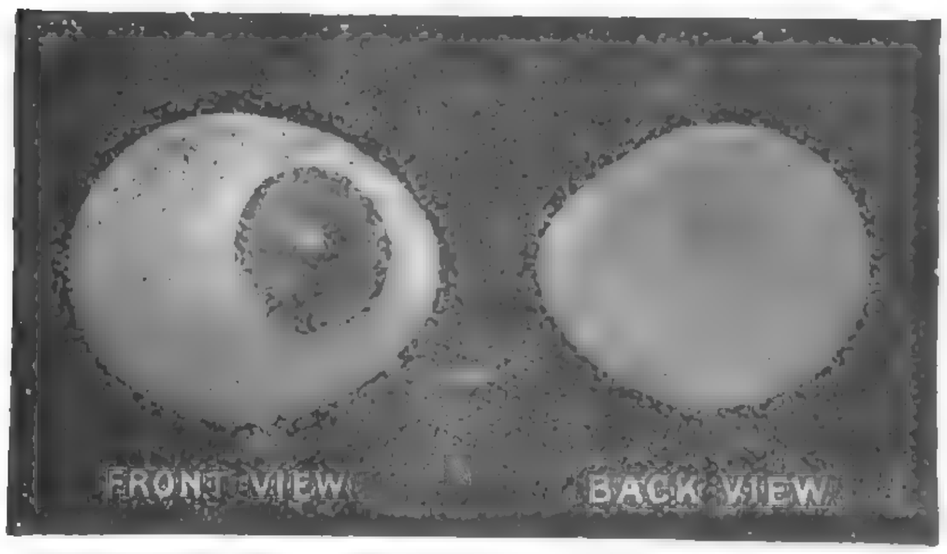
and have met with success. *ONLY ONE QUALITY:*

— THE BEST —

Write for Sample Pair to:— **F. ELEY & Co., 10a, Acton Street, W.C.1**

SNELLEN'S IMPROVED ARTIFICIAL EYES

PACHE & SON, 75, Station St., Birmingham.



MAKERS TO THE PRINCIPAL HOSPITALS.
Selections sent to Surgeons. Also Makers of the ordinary Shell Eye.

BRITISH OPTICAL INSTITUTE, LTD.,
(College of Optics).

Complete Training for the Sight-Testing Optician.

In addition to the usual Daily Classes and Correspondence Courses, there will commence shortly a series of Special Evening Classes, for those desirous of preparing themselves for any of the Optical Examinations.

A further series of Weekly Evening Lectures, and Demonstrations, for candidates for the F.B.O.A. Examination, and for post-graduates, has also been arranged.

Vacation Classes.

From July to October a series of Vacation Classes will be held for those who wish to widen their knowledge—not necessarily with a view to sitting for any examination.

The whole work of the Institute is carried out under the supervision of the Principal, assisted by Mr. G. W. Colebrook, F.B.O.A., F.S.M.C., (Master's Prizeman).

For full particulars apply to:—The Principal, Dr. MAX COQUB, B.Sc., Fern Lodge, 20a, Grove Road, Brixton, S.W.9
Telephone: Brixton 677.

A New Optical Publication.

"PRESCRIPTION PITFALLS
and How to Avoid Them,"
By HENRY C. RAXWORTHY
("Obfuscando")
ONE SHILLING AND SIXPENCE.

No Retailer or Wholesaler should be without a copy. An entirely original work.

Published by The HATTON PRESS, Ltd.,
and obtainable of all wholesalers.

PERCY S. DE SAULLES.

Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES.
Micro Cover Glasses, Glass Cells and Cavity Slips, etc.

The Platts, Amblecote, Stourbridge.

DIXON & HEMPENSTALL,
Wholesale and Manufacturing Opticians,
12, SUFFOLK STREET, DUBLIN.

Telegrams "Optics, Dublin."



OPTICAL BLOCKS

To illustrate all features
of Optical Service. Write for lists.

CHEMISTS' DESIGN SERVICE
12 Humberstone Gate, LEICESTER.

C. BAKER 244 HIGH HOLBORN LONDON
Estab. 1765

Sight Testing Apparatus
of all descriptions
SECOND-HAND
Fully Guaranteed.
WRITE TO-DAY FOR SECOND-HAND LIST.

W. P. THOMPSON.
F.C.S., M.I.Mech.E., F.I.C.P.A.
C. G. DYMOND,
M.I.Mech.E., F.I.C.P.A

W. P. THOMPSON & CO.,
12, CHURCH STREET, LIVERPOOL.
Chartered Patent Agents.
H. E. POTTS,
M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG.
M.T.I., F.I.C.P.A.

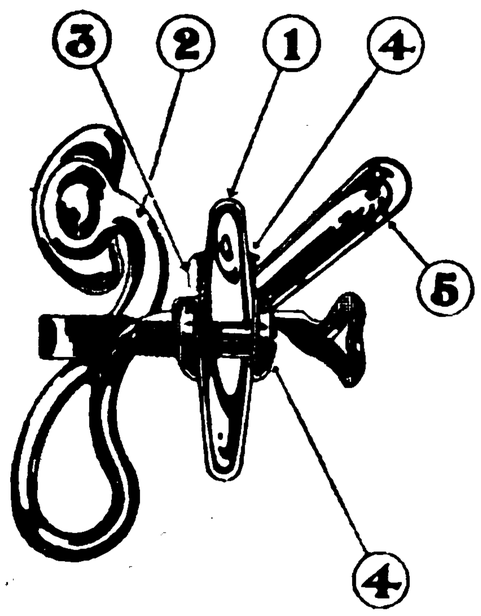
T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and AERONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
ESTABLISHED 1878 TELEPHONE CITY 419

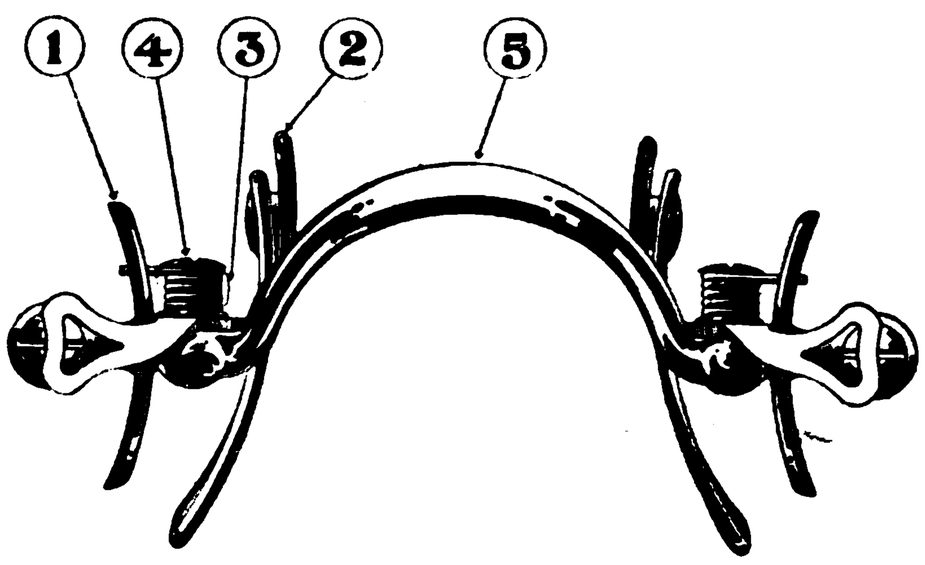
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

TENNYSON OPTICAL PRODUCTS.

BRITISH MANUFACTURE.

THE FIRST PRODUCTION.





1.—STRAP. Supplied from 1½ to 5 m/m widths in ½ m/m variations. Each dimension is exact and the strap holds the lenses at the right plane to the eye in relation to the bridge.

2.—GUARDS. These are provided with movable top to prevent friction in wear and are adjusted so as to maintain a level and even balance.

3.—SPRINGS. A lever movement of the springs is located centrally, and the springs are so tempered that an equal pressure is given and maintained by either guard.

4.—SCREWS. The screws are specially made with a thread that will not allow them to work loose, resulting that lenses are firmly held.

5.—BRIDGE. The bridge is supplied in 27 Fittings, so that any type of nose may be fitted with accuracy and comfort.

THE "PRINCE" FINGERPIECE MOUNT.

This is, by common consent of leading optical authority, a finer production than any similar foreign article. In design it possesses points of distinct superiority, while in finish it co-forms to the very highest standards, and is characteristic of British thoroughness in manufacture. You are an expert, consider its features indicated in the above enlarged diagram. This is a typical T.O.P. Line, and is designed upon a type which we feel represents the present trend of public choice.

ORDER THROUGH YOUR WHOLESALER.

THE "PRINCE" FITTING SET.

We shall be pleased to send you T.O.P. Illustrated Catalogue on application.

OPTICS Ltd.,

TENNYSON WORKS, WILLESDEN LANE, LONDON, N.W.6

WHOLESALE AND EXPORT ONLY

GUARANTEED BRITISH MANUFACTURE PRODUCTS

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d. per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

A.O.C. Worcester Automatic Rimless Machine for sale, also Simplex Rimless Edger. Apply, Lancaster & Thorpe, Opticians, Derby.

FOR SALE. Fine 4-prism Browning Spectrometer in perfect condition. Complete with three eye-pieces, and all accessories. Can be inspected in London by appointment. Reply, Box 3486, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

WANTED. Sight-testing business, Lancashire Cheshire preferred. Investigation. 231, Lansdowne Road, Birkenhead.

FOR SALE. Old established optical business in main thoroughfare of Glasgow. Low rental. Apply, Box 3417 c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 8*

GOOD All-round repairer and frame maker, also rimless and glazing. W. Hiatt, 267, Essex Road, Islington, N.

JUNIOR Assistant required with knowledge of sight-testing and general optical and photographic apparatus. Write, giving full particulars of experience, etc., to W. Watson & Glover, 2, Easy Row, Birmingham.

PUBLIC AUCTION.

WITHOUT RESERVE.

Re—E. T. GARDINER—By Order of The Trustee—William Osborne, Esq. (Messrs. Corfield and Cripwell), Balfour House, Finsbury Pavement, E.C., 2—UNDER A DEED of ASSIGNMENT.

SALE BY AUCTION
of the remaining
STOCK OF AN OPTICIAN.

including 2,500 pairs of Spectacle lenses (British, American and Continental), Gold filled and nickel spectacle frames, rolled gold and tortoiseshell lorgnettes, glazed spectacles, mounts, motor goggles, a barograph, prism binoculars and miscellanies, which will be

SOLD BY AUCTION by

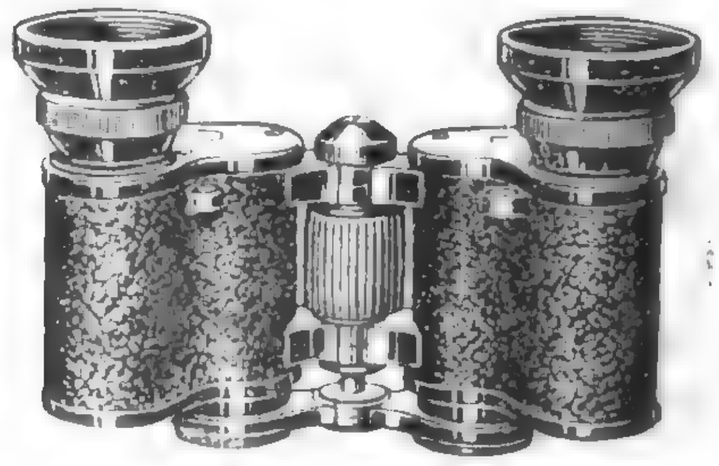
DEBENHAM STORR & SONS, LTD.,

at 26, King Street, Covent Garden, W.C.2., on FRIDAY, NOVEMBER the 11th, 1921, at 12 noon.

Catalogues post free on application.

Telegrams: "Viewing," London. Telephone: Gerrard, 2398.

DAVIES, COLEMAN & COY., LTD.



DACOL.

We should like our customers to tell their customers that

His Royal Highness
The Prince of Wales.

has purchased a **Dacol** Binocular for use on his tour in India.

45 & 46, FETTER LANE, E.C.4

Elliott Optical Co.,

104 & 105 GT. SAFFRON HILL,

LONDON, E.C.1

TRADE MARK.

There is no Better House for

Rx Work.

RXS. RETURNED PROMPTLY, ACCURATELY DISPENSED and at REASONABLE PRICES.

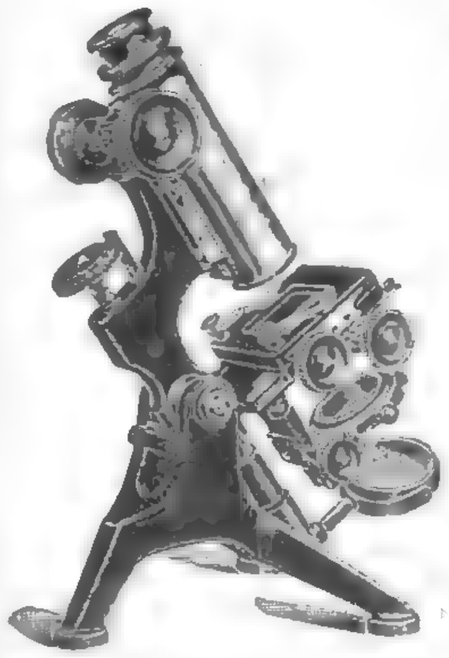
Complete Outfit of Rx Stationery supplied, Free of Charge.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

SELL WATSONS'
BRITISH-MADE
MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,
313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1937.

WILLESDEN
IS A BIG PLACE

There is more than one Optical house in Willesden but only one W.O.W.

We are not connected in any way with other Optical concerns in Willesden or elsewhere.

Keep W.O.W. distinct in your mind.

Think of quality and W.O.W. as synonymous terms—and you are right.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY:
DUDDEN HILL LANE, N.W.10

Rx

SANDRO LOWY
Optical Rx Specialist,
88, Goswell Road,
LONDON, E.C. 1

Telephone: CITY 304 (two lines)

Telegrams: SANOPTIC, LONDON.

Rx

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

The Employment Bureau.

A.—**Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

ALFRED MILLS & CO.,
HAVE VACANCIES FOR
EXPERT (FEMALE) CHECKER.
EXPERT (FEMALE) RIMLESS FITTER.
Also an all-round jobbing man, only first class workers required. 22 & 23, Verulam Street, E.C.1.

WANTED Experienced rimless fitter used to Rx work, male or female. Write, stating age, experience and salary required to "Permanency," Box 5728, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED immediately experienced refractionist, to have all-round knowledge of glazing, etc. Stone's, Corridor, Bath.

EXPERIENCED Refractionist required holding either B.O.A. or S.M.C. diploma, to manage branch in a South Coast watering place. Send full particulars of salary required to H.E.G., c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED. Rimless driller and fitter, able to set and adjust to measurements as ordered. Box 5726, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED. Shell and gold worker for repairs and adjustments. Box 5727, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN, 21, studying for F.S.M.C. desires progressive position in retail optical trade. Box 5725, c/o "The Optician," 125, Fleet Street, E.C.4.

OPTICAL INSTRUMENTS. Test room assistant, conscientious worker, requires position any capacity, twelve years' general experience instrument work, control of labour. Box 5724, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG LADY, 22, five years' experience, seeks change. Thoroughly experienced in all prescription work, checking, measuring, adjusting knowledge of glazing, drilling and rimless fitting, slight knowledge of book-keeping and typing. Box 5723, c/o "The Optician," 125, Fleet Street, E.C.4.

JUNIOR Assistant with knowledge of sight-testing wanted for North of England. All particulars to Box 5722, c/o "The Optician," 125, Fleet Street, E.C.4.

A FIRST-CLASS rimless edger and fitter required by Midland firm. Box 5721, c/o "The Optician," 125, Fleet Street, E.C.4.

JUNIOR Jobbing hand required by the Elliott Optical Company, 104 & 105, Great Saffron Hill, E.C.1.

METEOROLOGICAL and Scientific Instrument Maker, disengaged, requires position, maker or repairer, hand-turning, bench work, finishing, lacquering, own tools. 18 years' experience, any distance. F. Orford, 83, Ashmore Road, Paddington, W.9.

EMPLOYER can recommend a thoroughly reliable and qualified manager, for a similar position. Apply, Box 5719, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., D.B.O.A. (21), seeks re-engagement in London district. Box 5718, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS All-round gold worker requires situation, used to taking charge. Town, country or abroad. Apply, Box 5716, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED for India by Walter Bushnell, Ltd. A young single man, B.O.A. or S.M.C. State age, experience and fullest details re experience, character, etc., in strict confidence to Box 5717, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., 24, requires change, as sight-testing assistant or branch manager. London district preferred. Apply, Box 5715, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED Refractionist, 25, neutralising, transposing, cutting, drilling, rimless fitting, and all jobbing. 8 years' experience. Studying for S.M.C. F. Holt, 20, Lannoy Road, New Eltham, S.E.9.

LADY, Qualified, D.B.O.A., slight knowledge of retinoscopy, seeks engagement in London. Box 5714, c/o "The Optician, 125, Fleet Street, E.C.4.

D.B.O.A. passed part F.B.O.A., competent and careful tester, requires post in London or Midlands. Three years' experience. Age 29. Lidiard, 33, Chalk Hill, Watford.

YOUNG MAN recently qualified desires berth where opportunity for advancement and good experience can be gained. Must be in or near London or Glasgow. Box 5708, c/o "The Optician," 125, Fleet Street, E.C.4.

RETAIL Assistant, 15 years' experience, highest credentials, would like to travel in Ireland for wholesale firm. What offers to Box 5703, c/o "The Optician," 125, Fleet Street, E.C.4.

A "FIRST" Assistant, 10 years' optical experience with eminent houses, desires change. Fully competent in sight-testing, fitting and all workshop jobbing. Also thoroughly conversant with photographic department. Moderate salary, Box 5701, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACER, 24, seeks position London or suburbs. Thorough experience in kryptoks, segments, etc. Apply, T.D., 251, East India Dock Road, E.14.

ASSISTANT, 19, seeks situation with optician, nearly two years' experience, familiar with prescription work. Studying for F.S.M.C. City preferred. P.V.T., 292, Lancaster Road, Kensington, W.11.

RELIABLE Sight-tester qualified seeks berth as first assistant or manager, workshop experience. Box 5709, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. desires morning work. Experienced tester, good salesman. Would consider attending jewellers or chemist to start sight-testing side, own equipment if necessary. Box 5706, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT required temporarily, Midlands. Particulars of sight-testing experience, age and salary to Box 5707, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN, 23, keen, D.B.O.A., retail experience, seeks position as representative of wholesale firm. Willing to go abroad. Box 5705, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED Refractionist, retinoscopist, etc., seeks change, good personality, long sight-testing experience. Reply, J.H., 58, Hugh Gardens, Benwell, Newcastle-on-Tyne.

EXPERIENCED Refractionist, competent at repairs, edging, glazing rimless, bifocal and shell work, used to management, desires change. Excellent credentials. Box 5704, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN, 21, 6½ years' retail experience would like to take up wholesale work. Willing to commence at small salary. Apply, Allen, 7, Dunford Road, Holloway, N.7.

GIRL required for looking out prescription work, marking off, and checking for wholesale house in London. Permanent. Apply Box Office, No. 5710, c/o "The Optician," 125, Fleet Street, E.C.4.

REQUIRED by energetic man, 28, position as manager or first assistant, 10 years' experience. Good salesman. Capable refractionist, disengaged. Box 5711, c/o "The Optician, 125, Fleet Street, E.C.4.

Concluded on page 6.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE MIDGET



OPERA GLASS

(Licensed under Patent 12148/1912.)

(Actual size of Illustration.)

Perfect Interpupillary Adjustment.
Superior Lenses.

Claims immediate attention and commands ready sale.

Choice variety:—BLACK MOROCCO, GILT, FANCY LEATHER, PEARL, etc.

WRITE FOR SAMPLE.

R. ARCHER & SONS, Ltd.,

1, AMWELL STREET, LONDON, E.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

AMERICAN OPTICAL COMPANY, LIMITED


M91


M92


M51

OPTICAL MACHINERY.

Wellsworth optical machinery is the product of perfect materials plus skill and experience.

Only those materials best suited to the work in hand are used, and the entire process of manufacture is left to skilful mechanics whose long acquaintance with the work has made them able to gauge the accuracy of a product to a fine degree. You must have machines made by men who know and understand your problems. Your drills must be accurate, your edger must grind true to axis, in short, your machines must inspire you with perfect confidence.

Wellsworth machinery will justify your full confidence.

New machinery catalogue on application.

WELLSWORTH

TRADE (A) MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No 39 Hatton Garden, E.C., LONDON

Published by The Fleetway Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C. (Printed by The Century Press, Fulham.) Nov. 4, 1921.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The OPTICIAN
And SCIENTIFIC INSTRUMENT MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1598 FRIDAY, NOV. 11, 1921.

ROSS BINOCULARS.



British Government Tests have proved these to be the finest Binoculars in the world.

Send for our new catalogues and terms.

ROSS Ltd., Clapham Common, LONDON, S.W. 4

ELLIOTT'S Rx SERVICE

leaves nothing to be desired.

ACCURACY—PROMPTNESS and REASONABLE PRICES.

104 5, GT. SAFFRON HILL, E.C. 1



STOCK OPERA GLASSES

For Pre-duty Prices.

For the Coming Season.

NOW— ARCHER SELECTION.

R. ARCHER & SONS, Ltd.,
1, Amwell Street, London, E.C.1

Reg'd at the G.P.O. as a newspaper **PRICE 4d** *Subscription post free 12 months* **17s**
Postage in United Kingdom **1d**

Foreign Subscription including "Optical Almanac," post free **20s.** *yearly. The Hatton Press Ltd., E.C.1.*

Digitized by Google Original from THE OHIO STATE UNIVERSITY

AMERICAN·OPTICAL·COMPANY, LIMITED.

A Case of Color



Wellsworth Imitation Leather Cases

Supplied in MG Covering in Three Colors.

Green Blue Wine

At the Same Price as Black MG Cases

Three beautiful colors to pick from. In addition to the usual Black MG covering on Wellsworth Imitation Leather Cases, you can secure either Green, Blue or Wine Cases, or an assortment of four colors, and at the same price as charged for plain black MG cases.

Wellsworth Imitation Leather Cases have tight snug-fitting covers that keep the dust out. Patented self-closing positive action spring is inconspicuous and noiseless. Heavy gauge steel cover strengthens case and means added lens protection. Covering and lining vulcanized to metal prevents rusting finished with smooth fitting, high grade, fast color velvet and selected chamois. Properly covered edges wear well and long.

Ask your Jobber for Wellsworth Colored Imitation Cases.

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

GEORGE CULVER LTD

Manufacturing Opticians,

JOBBING AND PRESCRIPTION WORK

ACCURACY, NEATNESS, PROMPTNESS

Large and full stocks of English made Lenses of all combinations. Orders can be executed promptly.

OPTICAL WORKS:
WHITE LION STREET,
PENTONVILLE,
LONDON, N.1

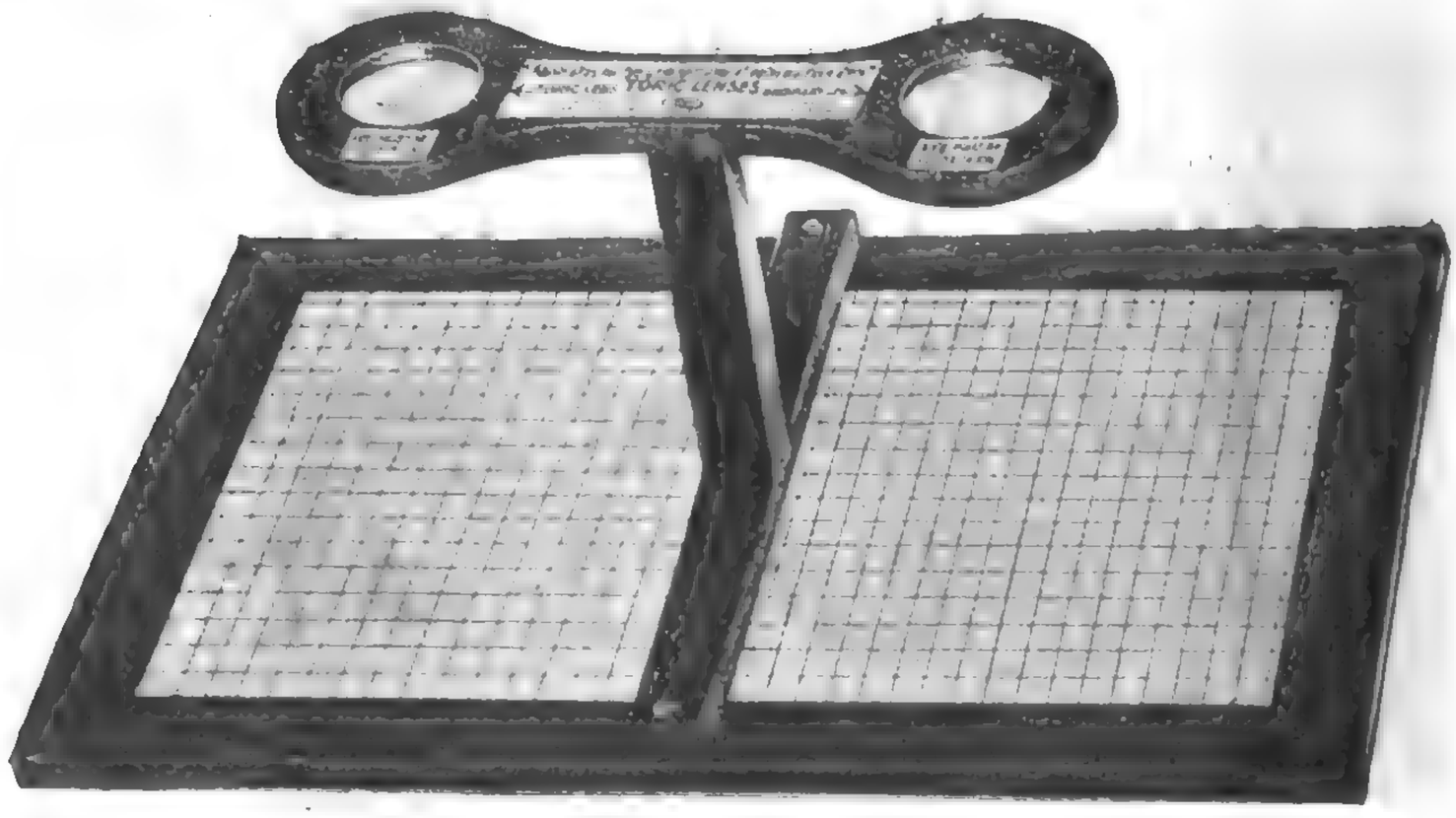
TELEPHONE:
NORTH 369 and 871

Digitized by Google Original from THE OHIO STATE UNIVERSITY

J&R F LTD

SIMPLIFIED FORM OF

TORIC DEMONSTRATOR



Designed for the Counter or Waiting Room Table.

Demonstrates itself.

No time lost explaining elaborate apparatus to clients.

No lights or working parts to get out of order.

Inexpensive.

Particulars on Application.

J. & R. FLEMING LTD.,

Telephone:
HOLBORN {814 / 815
HOLBORN {2788 / 2789} Prescription Dept.

136-148 Clerkenwell Road,
LONDON, E.C. 1.

Telegrams:
"OTTICO." LONDON.

Branches with Prescription equipment:

WALTER BRAHAM & Co. Ltd.
8, Ray Hill Drive,
BIRMINGHAM.
Phone: Central 2508
Telegrams: "Brahma."

37, WESTGATE STREET,
CARDIFF.
Phone: Cardiff 44
Telegrams: "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1085.
Telegrams: "Ottico."

8, SHUDEHILL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

J&R F LTD

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
The Rt. Hon. VISCOUNT HILI , L.C.C.

Upper Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Renter Warden
HARRY HYLTON-FOSTER. Esq., Past Master.

Director of Examinations
The Rt. Hon. Sir WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in May, 1922.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,598

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. City 3816.

LONDON, FRIDAY, NOV. 11, 1921.

Gyroscopic Directors.—For a number of years past efforts have been made by scientific instrument makers to perfect the application of the gyroscope to its most obviously and urgently required use—that of indicating the angular level and direction of an aeroplane when flying in cloud or fog. The announcement is made that a satisfactory gyroscopic apparatus of this type, to be known as the Reid control indicator, has been perfected and is now being manufactured by Messrs. Vickers, Ltd. It analyses, by means of a series of small electric lights, every tendency and movement of the aeroplane to which it is attached. It tells the pilot the air speed of his machine, its rate of turn when turning, and whether the machine is correctly banked for its rate of turn, and also direction of side-slip. It demonstrates, moreover, the movement necessary to enable the pilot to regain lost equilibrium and maintain a straight course. The instrument weighs rather less than four pounds. It is divided into three parts, an upper row of lamps controlled by a mercury level, a lower row controlled by a gyroscope, and an air speed indicator. If

Digitized by Google Original from THE OHIO STATE UNIVERSITY

the aeroplane is turning, the lamps in the lower row light up, beginning from the centre and working outwards, and so indicating the direction of the turn. If the machine is side-slipping lighting is produced on the same principle in the upper row. The port or left-hand lamps are red, the starboard or right are green. The centre lamp in both rows is white. If the two white lights remain constant the machine is on a straight course. The air speed indicator is set in the centre of the instrument and between the rows of lamps. From it the pilot can tell whether he is climbing or descending, according to whether his speed decreases or increases. The rotation of the gyroscope is effected by an air stream, created by the flight of the aeroplane, impinging on the gyro-wheel in which slots are cut. Under this air pressure the wheel spins at a rate of some 6,000 revolutions a minute.

* * *

1,000,000,000 Candle Power.—The French Air Ministry is now installing a new light signal, having a flashing power of one thousand million candles. It will be visible from a distance of two hundred miles, and will be the guiding light for night air expresses entering or leaving the Paris aerodrome at Le Bourget from the south. The new lighthouse will be erected on Mount Africa, a hill top rising to a height of 1,500 feet. As is, of course, well-known to our readers, this hitherto practically unheard of "candle-power" is not a thing extraordinary in itself. Candle-power is limited only by the absorptiveness of the atmosphere, and by effective reduction of the divergence of the projected beam. If these two factors, atmospheric transparency and the perfection of the optical system, could be fully controlled, the light of a single candle might be classified as of a billion candle-power at the appropriate distance.

* * *

Clinical Thermometers.—With regard to the Clinical Thermometers Bill, which as already announced (p. 158), is to be re-introduced next session, it has been stated in Parliament by the President of the Board of Trade that a majority of British manufacturers of clinicals are in the meantime voluntarily having their instruments tested at the National Physical Laboratory. Private individuals can have single clinical thermometers tested there for a fee of 1s. 6d.; the fee when large quantities are submitted being 3d. per instrument. The further question was asked on the 2nd inst., as to whether clinical thermometers of foreign make are accepted for testing at the National Physical Laboratory, and whether the Government will insist that such thermometers shall be marked with the country of origin as well as the letters "N.P.L.," in order to prevent the assumption that they are of British manufacture and with a view to safeguarding British industry. The reply given was that the standardisation mark of the National Physical Laboratory, which is registered under the Trade Marks Act, is and always has been, intended to convey merely a certificate of the accuracy of the articles marked. The laboratory was not in a position to determine or certify the origin of thermometers submitted to them. The question of requiring an indication of origin is part of the large question of the compulsory marking of foreign goods generally, which will be dealt with in a Bill to amend the Merchandise Marks Act that is to be introduced.

Recent Optical Patents.

Complete Specifications Published.

1920.

✓	167130	Heinstadt, Stereoscopic eye-pieces for microscopes.
	167793	Whitfield, Colour photography.
	167811	Clifton, Diaphrams of sound recording and reproducing instruments.
✓	167882	Barr & Stroud, Ltd., Optical apparatus for measuring small angles.
	167898	Emmrich, Shutter-actuating apparatus for photographic cameras.
	168100	Gorsky de Procoudine, Three-colour photography.
	168207	Wade, Scleroscopes.
	168211	Atherton, Magazine holder for spools of kinematograph films.
	168264	Hearson, Aperture sights for rifles.
	168370	Doncet, Sight projection, and lamps and like devices adapted for such projection.
✓	168379	Long & Standard Optical Co., Edge-grinding machines for lenses.
	168397	Brewer, Measuring and indicating apparatus.
	168497	Wright, Ltd., and Rule, Pocket clinometer.

1921.

	168831	Mosley, Apparatus for ensuring operation of a talking machine or machines in timed relation to a cinematograph machine.

Matter intended for the current weeks' "Optician" must reach this office on the Tuesday morning preceding publication.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The William Ettles Memorial Lecture

ON THE COMPARATIVE VALUE OF VARIOUS SKIAMETRIC METHODS AND PRACTICES.

Delivered by CHARLES SHEARD, A.B., A.M., Ph.D., Research Division of the American Optical Company, before The Institute of Ophthalmic Opticians.

Catholicity of notions, breadth of view, ability to be unselfishly interested in the work of other men, and withal the possession of the virtue of Christian charity are vouchsafed to relatively few persons. Dr. William Ettles was such a man, for he had the true interests of the science which was his life work close at heart. The spirit of the search for the truth pervaded his whole being, and coupled with the desire for the knowledge of the truth was the desire and ability to impart of his findings to his fellow practitioners, irrespective of the narrow confines of schools and confines of doctrines. During these years with which I have been familiar with the literature on various phases of physiological optics, I have had the pleasure of seeing the name Dr. Ettles attached to many articles of much importance. We have all of us been made better men and better practitioners by virtue of his life and his work. And as we gather here together to pay tribute to our colleague and fellow-worker who has gone on before us, we do so with the full assurance that no man who have lived and laboured as did Dr. Ettles shall have done so in vain.

Retinoscopy.

Dr. Ettles was particularly interested in the science of retinoscopy, as many call it, and many articles came from his pen on this subject, as well as on matters dealing with proper office and clinical arrangements and practices. It seems, therefore, to be appropriate that we should take as the subject of a lecture, bearing his name as a memorial, one which we may be sure would have aroused his keen interest and brought forth comment from his fertile brain were he with us. We shall, therefore, in that which follows, present to you some remarks upon the topic: "The Comparative Value of Various Methods and Practices in Skiametry".

It is not our purpose to go into the details of the methods and practices of static skiametry (or retinoscopy), for it may be with propriety assumed that my hearers are familiar with its fundamental principles. However, in opening this discussion it may be well to briefly point out some of the factors affecting visual acuity in order to, in the first place, show the necessity of some objective methods of examination and to then proceed to outline some of the advantages and disadvantages of the method of static skiametry. We may then be permitted to briefly discuss the technique of the dynamic skiametric procedures, pointing out the benefits to be derived from its use as an office or clinical practice.

Factors Affecting Visual Acuity Tests.

With respect to factors affecting visual acuity, let us briefly rehearse the more important:

(1) The Snellen test types of our clinics and offices are but assumed standards which are found to serve us rather conveniently in the practical work of ocular refraction. The acuity depends not only upon the quality of the dioptric apparatus but also upon that of the retina, of the optic nerve and of the brain.

(2) It is a well-known fact that some letters of the same size and subtending as a whole the same visual angle, are much more easily read than others. For if we take the ability to recognise the letter B at the five-minute angle as standard or V=1, we find that the average acuity required for the letter L, for example, of the same size and subtending the same visual angle is about V=7/10.

(3) Age affects the acuity for reasons which are obvious. In general there is in the healthy eye a slight but uniform decrease in acuity from the fortieth year on.

(4) The influence of pupillary diameter upon visual acuity is quite marked; the optimum pupil corresponds to about 3 or 4 mm. diameter. Hence eyes having equality of functions and structure in all particulars and yet varying unduly in pupillary area will have quite appreciable acuity differences.

(5) The condition of retinal adaptation plays a part in acuity conditions, for in general it is found that (*a*) for low intensities of illumination the visual acuity increases with darkness of adaptation; (*b*) for average luminosities it remains the same whether the retina is adapted or not; and (*c*) for high in-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

tensities of illumination the acuity decreases with darkness adaptation.

(6) All methods of observation and experimentation show conclusively that the visual acuity increases at first quite rapidly with small changes in the illumination, but that finally a very large increase in luminosity is demanded in order to change the acuity by a small percentage. This point is of significance in the matter of test-card lighting.

(7) Visual acuity increases and decreases more slowly under coloured illuminations having short wave-lengths than for the less refrangible radiations for any given variation in the objective luminous intensity. Also the acuity is greater in yellow light and decreases through red, green and blue.

Static Skiametry.

We, therefore, appreciate from these facts the sources of error underlying visual acuity methods of determining errors of refraction and must admit the necessity of some objective methods which will determine the excess or deficit in power of the eye in a manner analogous to that in which we determine the focal power or powers of a lens by neutralisation methods. Skiametry is an objective method of neutralising the error of an eye. For, by means of a mirror we illuminate the retina; the retina in turn becomes the luminous object, and is at one of the conjugate foci of the ocular system, and we are desirous of finding the other conjugate. If the second conjugate is at infinity we may arbitrarily bring this returning light to any point desired by using a lens of a power whose focal-length is equal to that of the observation point from the eye examined. If the point conjugate to the retina should lie between the eye observed and the observer, no lenses being used, evidently a condition of myopia exists; whereas if the conjugate should lie back of the observer a condition of hyperopia or of myopia of a lesser dioptric power than that represented by the observer's distance from the observed eye is known to exist.

The theory of static skiametry is simple and straight-forward, and as has been stated involves fundamentally nothing more than Foucault's method of determining the focal length of a lens, and is simply an application to the eye of methods familiar to those conversant with physical optics. But skiametry is a part of the practice of physiological optics—and therein lies the rub, for we cannot pick up, turn and twist the eye to suit ourselves as the physicist can his lenses. And we have an instrument of "blood and water," with muscles and mechanisms for changing the power of the eye, we have diaphragms of varying size and we have very decided aberration effects. And withal, we have a human being as the possessor of these eyes, with all the frailties, whims and fancies of human kind. Therefore we shall call attention at this time to the fact that under ideal conditions, with proper relaxation of the patients' accommodation, proper positions of visual axes with respect to the line of observation and examination and accurate centering of optic media, perfect neutralisation of skiametric motion should be possible; this method should therefore afford a means, par excellence, of determining objectively and hence scientifically accurately, the patients' farpoint.

But these ideal conditions rarely exist; there are certain possibilities of error in skiascopic tests which give rise to disagreements between such determinations and those made under subjective tests. We were rather severe in our criticisms of visual acuity tests as the unimpeachable standards and court of last resort in ocular refraction. With equal candour must we now turn and briefly enumerate and discuss some of the reasons why static skiametric tests may be inaccurate and incorrect, and not give us a true measure of the ametropia of an eye. The element of infallibility, it is always to be remembered, does not attach to any one single method or test, hence a comparison of all ocular data and a modification in the light of the evidence furnished by all tests is demanded in the determination of the final binocular findings.

Fixation Objects.

(1) *Ciliary Relaxation.*—Fixation definite but passive. If the subject under test looks vaguely into space without the assistance of some definite and visible fixation point, his gaze is likely to be uncertain in both direction as well as in space location. The subjection will invariably grope for some object at which to look, often the operator. To insure definiteness of fixation and to overcome this objection, the illuminated one hundred foot letter or letters may be used at twenty or more feet; if perchance this letter (or these letters) are not visible, the form of the illuminated chart as a whole, or the frame in which it lies will generally be so. *The great criterion in static methods is relaxation.* Hence, monocular fixation must be *definite* and *passive*.

Monocular fixation must obtain, since any possible relations involving accommodation and convergence in the act of binocular single vision are to be eliminated. Various

Digitized by Google Original from THE OHIO STATE UNIVERSITY



A Lantern Slide wanting *your* name.

We will supply you free with the above lantern slide, with your name and address incorporated.

The slide is both unusual in design and striking in colour scheme—to which we cannot, of course, do justice in a black-and-white reproduction. In the principles of balanced and pleasing salesmanship it is very far in advance of the great bulk of slides. Its use on your behalf is certain to cause considerable interest. The fact that lighting conditions in theatres and cinemas are very trying to the eyes adds potency to its message.

If you would care to have this slide, please write to us, and we will supply you promptly.

Remember—it is quite free.

CHANCE BROS. & Co., Ltd.,

Glass Works, Smethwick, BIRMINGHAM.



The late Sir William Crookes, O.M., F.R.S.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"WERTEX"
WILLMOTTS'
LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.



11c 11c

Having corrected a client's sight and supplied glasses, present them in a case *worth looking at.*

Use "WERTEX" Cases.

All particulars may be had from your dealer or direct from the manufacturers.

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

ENGLAND.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

schemes are possible in order to obtain passivity of gaze. One such device as used by the writer, and, in so far as known to him, first advocated by him, consists in turning up in the lens battery of the optometer, or introducing into the trial frame sufficient lens power to considerably over-correct any initially discovered hyperopia when only working distance lenses are inserted. The procedure is to then slowly reduce lenticular power until the maximum plus power just before reversal occurs is reached. The writer is satisfied that higher degrees of hyperopia will often be disclosed under such a *modus operandi*.

The Weakest Concave Lens.

In myopia, of course, the procedure is to employ the minimum minus lens possible. Then again, after making the monocular static retinoscopic findings we often find it of advantage to allow both eyes, wearing the monocular findings respectively, to passably fix; in this manner we determine the binocular static retinoscopic findings, and often find that from a quarter to occasionally as high as a diopter additional convex lens power can be added to either or both eyes before reversal occurs.

The reasons for this additional finding under binocular fixation for distance are well-known to you, for it is a matter of common knowledge in practice that one of the procedures in subjective testing should be to endeavour to add to both eyes as much plus lens power as possible after having obtained satisfactory monocular findings. Obviously such possibilities as spasm of accommodation, latency of hyperopia and inter-relationships of accommodation and convergence may exist and modify very materially the subjective and objective monocular findings. There are those who believe that ciliary relaxation is induced by putting over the eye not being tested a strong fogging lens, together with a four or five diopter prism base in, both eyes being thus left open, *i.e.*, uncovered during the test. The writer does not feel that this is as good a procedure as to make separate monocular, and then finally binocular static skiascopic findings.

(2) *Retinal Sensitiveness to Light.*—Retinæ unduly sensitive to light may cause in static retinoscopic methods a temporary irritation that will produce a spasm of the ciliary. Such reflex actions may be induced to relax by dimming the source of light used; this is very satisfactorily accomplished by use of the self-luminous instruments in which the luminosity may be controlled through a resistance. Perhaps some of you may object to the very unsatisfactory spot of light given by many self-luminous instruments because of the casting of the image of the filament in the form of an ellipse or the letter S, and even at the best giving a poor source of illumination for accurate determination of astigmatism. But this feature has been made almost ideally perfect in the latest self-luminous retinoscope devised in America, and the diffused light of low intensity is an admirable arrangement for accurate skiascopic work.

Sometimes lachrymation is so excessive and photophobia so pronounced that the findings have to be obtained *ad interim*, allowing time for the eyes to readjust themselves. Such conditions are a trial to the examiner, since there is first a motion "against," and a motion "with," or *vice versa*, and he is left in some doubt as to the true refractive error. But he has first-hand information, at any rate, as to the character of his case; and that is oftentimes of the greatest assistance, for he knows what to look for and what he must guard against in his subjective findings.

(3) *Irregular and Peripheral Refraction.*—Many retinoscopists are called, but few are chosen. Many practitioners judge themselves to be skilled in the use of this most valuable refractive instrument, whereas as a matter of fact they fail to do two things which, paradoxically, become as one, namely: to disregard all peripheral conditions and to give heed strictly to the reflex or skiascopic movement in the visual zone. Irregularities, neutralisation of shadows and even reversals of motion may occur in the peripheral regions in fairly large pupils due to aberration and other effects. These are at times very confusing and annoying to even skilled operators. Often thin, colourless ribbons, approaching in form the band condition peculiar to astigmatism, may arise which are due to irregularities and reflexions in or from various dioptric surfaces or media. These generally fail to prove out in subjective testings. We have seen many men of fair experience—in matter of time or service at least—considerably undercorrect hyperopia and overcorrect myopia from the standpoint of static retinoscopic findings.

Working Distance.

The writer has made it a practice to work at about twenty-six inches and allow one diopter only for the working distance. No scientific reason, in the sense of a theoretical reason, can be assigned. We can only say that we do feel that hyperopia is too often under-corrected and myopia over-corrected, and low hyperopia too often fitted with weak concave lenses. While we do not feel as

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

though we could go as far as some ophthalmological writers do and declare that the retinoscopic findings made at one meter working distance without cycloplegics should have no allowance made for the working distance, we do feel that some such allowance should as a general rule be made by the retinoscopist, and that its value should approximate a half diopter.

(4) *Macular and Non-Macular Refraction.* —One of the chief sources of error in static skiascopy is the fact that most practitioners do not make the findings along the visual axis. In subjective findings the image of the letter fixed is formed at the fovea. In retinoscopy, without cycloplegics, the eye is deviated some degrees from the line of the examiners' observation, hence the reflex and shadow are concerned with parts of the retina not concerned with refraction along the visual axis. It is possible that, in many instances, the image from the operator's mirror may fall at or near the optic disc; this is evidenced by the character of the reflexes obtained and is to be avoided. To find the true *spherical* error by retinoscopic procedures, therefore, it is essential that the examination shall be along the visual axis, that the fovea may be the conjugate point in skiascopic work the same as it is in subjective testing.

And again, if a high-powered lens is rotated about an axis, a cylindrical effect is introduced. The eye is of high dioptric power; the turning of the eye a few degrees such that the line of examination is oblique or makes an angle with the visual axis is sufficient to materially interfere with the correct finding of the amount and the axis of the astigmia, or again to introduce astigmatism when not present, or to change a low amount of astigmatism with the rule to a corresponding amount against the rule. You must all have had illustrations of this;cases which gave, let us say, retinoscopically +0.25 ax. 180, when careful subjective tests gave +0.25 ax. 90. One of the chief inaccuracies, therefore, in static retinoscopic methods lies in our failure to commonly make our findings along the visual axis.

Reflected Fixation Letters.

This defect can be easily remedied, for Eberhardt, Armbruster and Herbin have devised schemes (which are essentially the same) consisting of parallel mirrors set at an angle of forty-five degrees on a suitable bar, so arranged that the form of a distant letter may be reflected from one mirror into the second and thence into the eye. The eye to be examined may in this way passively fix a letter while the examiner makes his static skiascopic findings along the visual axis, thus affording himself greater accuracy in both spherical and cylindrical corrections and getting rid of spurious and annoying reflexes. The possibility of inaccuracy in findings is thus reduced to a minimum. So we have to say that it is our belief that static retinoscopic findings when properly made, given heed to the points especially which we have been discussing, do afford the most accurate determinations of the refractive excesses and deficiencies when the eyes are engaged in the general work of distance seeing.

For vision which may be called distant seeing, to differentiate it from close work such as reading, involves a minimum of accommodation to see clearly and a minimum of convergence to see singly. There should be theoretically no accommodation and no convergence demanded at distance. Practically speaking, however, a pair of eyes slightly hyperopic and slightly exophoric will be the best seeing and most keenly working binocular machine.

Dynamic Skiametry.

But we have pointed out that visual acuity tests have their weaknesses, and we have discussed some of the inaccuracies which may creep into static retinoscopic methods. Both subjective and static retinoscopic findings are, however, solely for the purpose of correcting anomalies and errors of refraction, or, in other words, putting the far point of the eye in each and every meridian at infinity. They are used, then, to give keener distance vision, as in hyperopia, myopia, and astigmatism, or to allay unnecessary ciliary action as in hyperopia, or to supply a deficit in myopia so that the function of accommodation will be presumably called into action to the normal amount at all points within the far point.

Subjective visual acuity tests and static retinoscopic tests do not concern themselves with accommodation—the act of seeing distinctly at points inside infinity or convergence —the act of binocular single vision, nor do such methods concern themselves with the relationships between accommodation and convergence, or the derangement of one or the other, or again their mal-co-ordination.

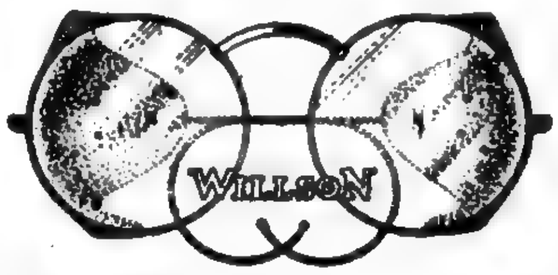
Static skiametry is exactly what its title says it is; if we wish to objectively investigate the amplitude of accommodation, the excesses or deficiences of accommodation, or again find out how much assistance the eye would accept under any specified condition of relative ac-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

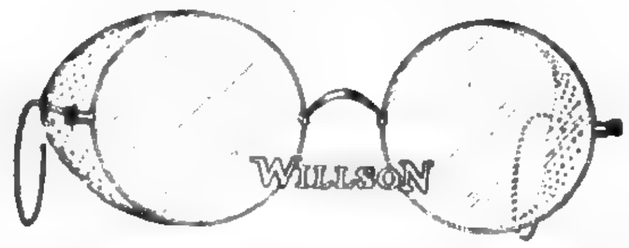
WILLSON GOGGLES

We Invite Correspondence.

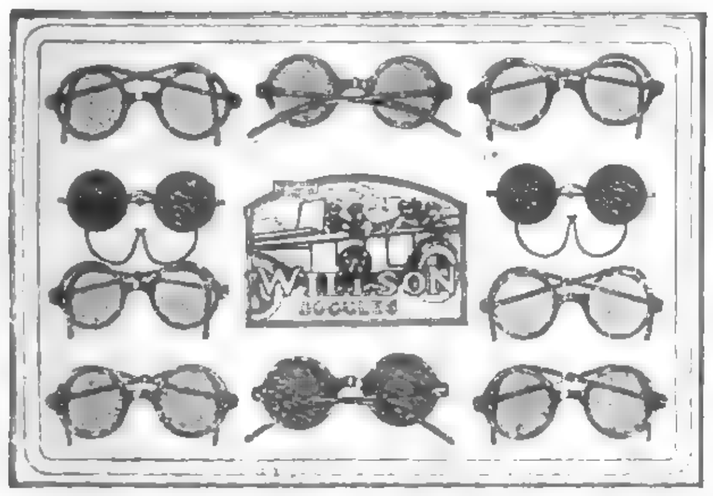
We manufacture goggles for protecting the eyes from sunlight, dust, glare and wind. Also safety goggles for protecting workmen at industrial operations.



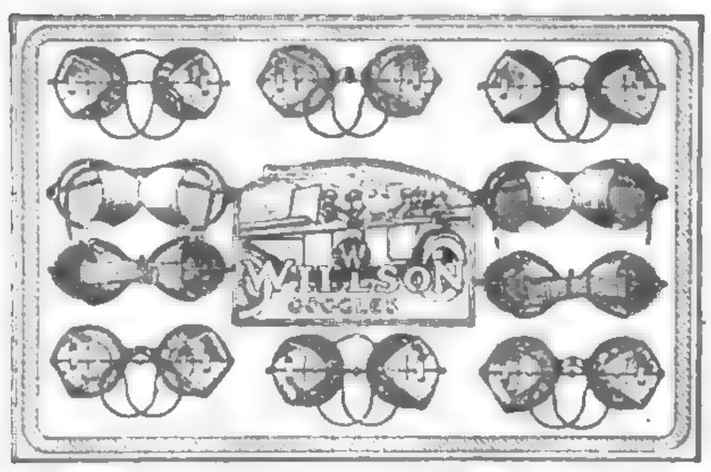
Style A1.—48mm micoquille lenses in amber, fieuzal, smoke and amethyst colors; or clear. Good leather side shields, adjustable bridge and cable temples. Metal case.



Style N88.—48mm micoquille lenses in amber, fieuzal, smoke and amethyst colors; or clear. Perforated metal side shields, saddle bridge and cable temples. Cardboard box.

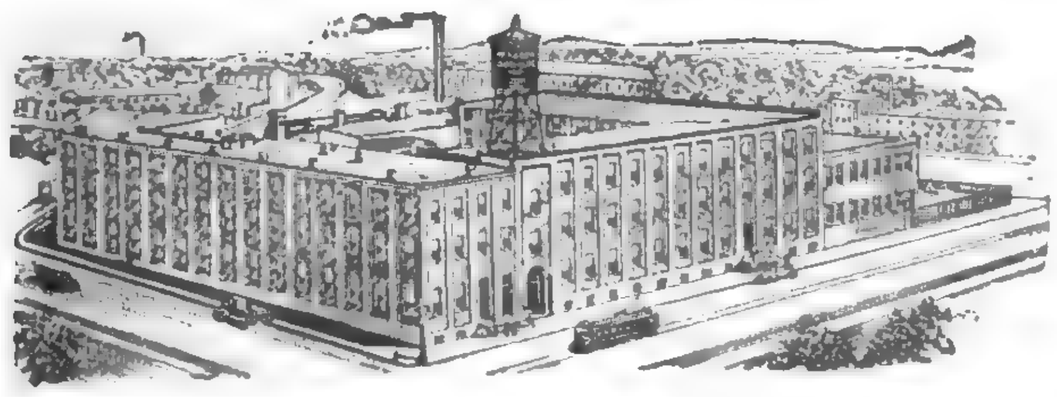


Assortment Y10.—Ten high-grade imitation shell goggles WITHOUT side shields displayed on a heavy, colored artboard with easel. The goggles are sold off this display at a uniform price. Strong shipping container.



Assortment Y15.—Ten high-grade goggles WITH side shields. Assorted styles of imitation shell, white metal and their combinations. Same display board and shipping container.

These assortments have good-quality micoquille lenses in the most popular colors.



WILLSON GOGGLES INC., READING, PA., U.SA.

British Office and Warehouse: S. PULZER, 9, Hatton Garden, London, E.C.1

Australasian Representative, WILLIAM LEWIS, Ltd., Stafford House, 316, Pitt St., Sydney.

Largest plant in the world devoted exclusively to the manufacture of eye-protective devices. Trade Mark Registered in The United States Patent Office, Great Britain, Australia, France, Brazil, Argentine, Chile, Bolivia, Peru, Uruguay, Cuba and Japan.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

OPTICAL MANUFACTURERS LTD.,

(Incorporating Wheway Optical Co., Ltd.)

WAR TIME CONTRACTORS TO THE ARMY SPECTACLE DEPOT.

Manufacture for the Wholesale Trade:—

Gold and Gold Filled Spectacle and Astig Frames.

Gold and Gold Filled Rimless Spectacle and Finger Piece Mountings.

Gold and Gold Filled Monocles and Reading Glasses.

Solid Nickel Spectacle and Astig Frames.

Solid Nickel Pillar Frames and Folding Gauze Spectacles.

Steel Spectacle Frames.

Spectacle Sides and Jobbing Materials, in all Metals.

Extract from a letter just received by a large Wholesale House:

"We have sold Wheways spectacles for a long time now, and as they have given us such all round satisfaction we have every confidence in them and desire to stock all their products where possible."

All these Articles are of **English Manufacture**

Works at VYSE STREET and GEM BUILDINGS, HOCKLEY HILL, BIRMINGHAM.

London Office: 55, HATTON GARDEN, E.C.1.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

commodation and convergence, we must turn to dynamic skiametry. Static skiametry has to do with distance findings; these findings may or may not be satisfactory for reading purposes, as, for example, in presbyopia; static skiametry makes no pretence at a solution of close-work ocular problems.

The Objective Method.

Dynamic skiametry, on the other hand, is an objective method of finding out whether or not the static findings will serve satisfactorily in near work. To my mind dynamic skiametry is useful chiefly, if not in its entirety, in finding out assistance which the accommodation either needs or will accept under the conditions imposed by virtue of the point fixed and for which accurate accommodation is undertaken. The dynamic skiametric method as devised by Cross in the early eighties consists in having the patient read letters or count dots on a fixation chart while the examiner takes note of the character of the reflex (shadow) in each eye, one eye after the other.

The procedure as commonly adopted in this method is to initially obtain by static retinoscopy those refractive findings which put the eyes, monocularly, in an optical condition such that the retina and the distant point, presumably passively fixed, are conjugate points. The distance connections are then inserted before the eyes under test, and the patient is told to read aloud a series of letters indiscriminately arranged, or count a number of fairly large dots upon a test card attached to the retinoscope. This test is a binocular one in general, since both eyes are involved, hence convergence and accommodation are both demanded in order that binocular single vision may ensue. While the subject under test is reading the letters or counting the dots the examiner takes notes of the character of the reflex or shadow in each eye, one after the other. Should he find a *with* motion, using a plane mirror or the Cross form of dynamic skiascope, the practitioner then proceeds, according to the method generally advocated, to add such convex lenses as will give a slight over-correction binocularly, as evidenced by the *against* character of the skiascopically obtained shadows.

Or again, the following method may be adopted; the person under test is instructed to fix a point on or *very* close to the examiner's skiascopic mirror; the operator chooses whatever distance he desires and then determines the lens quantities which will just produce a reversal of shadow. We believe that these statements cover, in essentials at least, the mechanical procedure, unless we add to these remarks the further statement that, should an *against* motion be obtained with fixation and observation at any given point, concave lenses should be added until a neutral shadow is found in both eyes. The fixation point, when fixation and skiascopic observation are made at one and the same position, may be varied to suit the practitioner. Commonly chosen points vary from ten to twenty inches from the eyes under examination. This method, which we may designate as the simultaneous fixation-observation procedure, may be modified as has been suggested by Cross, and fixation may be demanded at any desired point through the medium of a suitable chart or test object, while the reversal of skiametric shadows is sought at another point. For example, fixation may be made at forty inches, and the reversal point sought and found at twenty-six inches. This procedure is analogous to that which may be used in myopic cases under static skiascopic methods in which the points or positions of skiametric reversal may be located.

Reversal Point Measurements.

The writer rarely uses either of these static or dynamic determination of reversal point methods, for the reason that measurements of distances are likely to be too inaccurate to be of value from an exact refractive standpoint. This measurement method of finding the skiascopic neutralising lens quantity is, however, very rapid and satisfactory for obtaining the order and magnitude of the error in either static or dynamic procedures, particularly in cases where the reversal point is within a one-meter distance. The "fixation-at-one-point and observation-at-another-point" method of operation in dynamic skiametry has been criticised by many on the basis that it is impossible for the patient to read the letters on the chart and still have an observational reversal point at another position. This criticism is unwarranted, provided there is not instituted a change of lenses before the patient's eyes to bring the skiametric reversal at any specified point. For "ray values" have their equivalent lenticular counterparts. If fixation should be made at twenty inches, for example, and the operator should find a neutral point at one meter (equivalent to 1D.), then, under the procedure as we shall outline it, we have evidence that +1D. lenses are required in order that the positive range of relative accommodation, the negative range of relative accommodation, and the convergence may be properly correlated. But more of this in that which follows.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Cross recommends the use of his own peculiar form of skiameter which carries a light frame attached to the mirror support in such a manner that one fixation card is slightly behind and the other slightly in advance of the operator's nodal point. The fundamental principle underlying this device is that when full correction has been approximated with fixation at the card more remote from the subject's eye, a quick change to the slightly nearer fixation object is made possible, and that, if there is then a *reversal* of shadow, a correct refractive finding as to the needs of a pair of eyes *at the point fixed* has been found in order that the accommodative and convergence relations may be properly maintained. The writer of this treatise differs from Cross as to his notions of just what this dynamic test means, and, therefore, in his *modus operandi*, for he uses the simple form of plane retinoscope with a small card attached thereto, and printed in heavy-face eight to ten point type. In passing, let it be stated that the card which serves as the test object should be sufficiently illuminated; we carry out such tests in a room well-lighted artificially.

Accommodation and Convergence.

In his presentation of the theory of dynamic skiametry Cross writes: "While the static method of practising skiametry is one where the ciliary muscle of an eye is at rest, the dynamic method is the exact reverse of this, and is made while the accommodation is exerting itself sufficiently to readily accept refractive assistance up to a point where its relation with convergence is interfered with. So in dynamic skiametry a call is made for a pronounced increase of the accommodation by having the patient read a series of test letters placed on the observer's brow" (the writer then gives other methods), "then varying this tension as judgment teaches, and by being able to easily supply required artificial lens power, *the accommodation is reduced to its normal relationship with convergence.* And most eyes, no matter what the age of the patient may be, *will only surrender the accommodative excess* which has been required to maintain near-vision. The relationship between accommodation and convergence, if roughly stated, is found to be in about the proportion of one to three for the two eyes."

The writer's interpretation of these statements of Cross is that he (Cross) believes that the accommodative excess will be surrendered only to the extent of the establishment of a normal "one to three" ratio between accommodation and convergence. We are not much in accord with the theory of Cross as quoted, or as amplified in his book. We are, however, in agreement with the statement that tests can be made to determine when the accommodation is reduced to its normal relationship point. But our procedure and interpretation are somewhat different. For we have the phenomenon of the relative range of accommodation to consider when the convergence remains fixed and constant. When fixation is demanded and obtained at any point a definite convergence is involved. Subjectively, we may use the Gardiner or Howe forms of optometers and proceed to find out how much convex lens power can be added before the test type, normal or taken as the standard, for the *distance of the test*, becomes blurred and unreadable. This determines the negative range of relative accommodation.

We may well ask the question at this point: Is not dynamic skiametry, when practised with fixation and observation points identical, and convex lens power added (or concave lens power removed) until skiametric reversal occurs, simply and purely an objective method of determining the negative range of accommodation? We believe it is, and if so it is a most valuable asset in investigations upon ocular conditions. A citation from Cross—which can be repeated by anyone in almost any case of hyperopia—supports this view. He writes: "Case 1. Fixation, 40 inches; observation 39 inches. Shadow with the mirror. Can add plus 1 D. before reversal occurs. But with fixation and observation at sixteen inches, a total of plus 1.50 D. can be added before reversal takes place. Same result is obtained with fixation and observation at thirteen inches."

These results are in accord with an affirmative answer to our question, for relative accommodation convergence curves show, except in rather rare cases, a decrease in the positive range (through concave lenses), and an increase (through convex lenses) of the relative amplitudes as the fixation and, therefore, the convergence are changed. The writer believes that a careful study of a few cases by both relative range of accommodation and convergence subjective methods and by dynamic skiametric tests will substantiate this explanation.

An Objective Method.

The question may, therefore, be very properly raised at this juncture: Is there any objective method of procedure whereby one can determine the lenticular assistance needed in binocular single vision at any given reading

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

"Stork"

Automatic Eyeglass

BRITISH MADE.

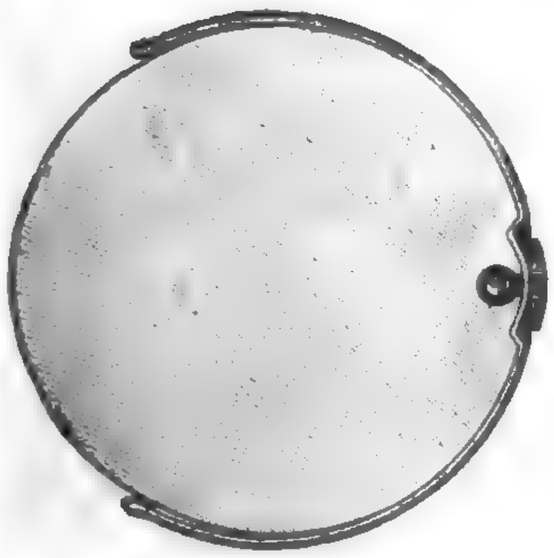
Holder

PAT. APPD. FOR

Constructed on an Entirely New Principle, this chain is Mechanically Perfect.

It embodies all the essentials of the reliable eyeglass holder and is a chain that can be recommended with confidence.

Strongly made yet neat and well-finished. Action combining simplicity with Certainty. Locking Bolt makes accidental recoil of chain impossible. British Made and reasonable in price. Chain can be worn at any length.



The "COURT" Invisible Gallery Oxford.

Adaptable to any Size or Shape of Eye.
Made in 9ct. Gold.

Rd. No. 682819.

Samples and prices sent on application to

WALTER H. THOMPSON,

: 66, HATTON GARDEN, E.C. 1 :

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713 (Two Lines).

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

L.O.C.

You take no risk whatever of giving your customers dissatisfaction when your Rx Work is always sent to L.O.C. to handle.

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Ruelde la Pepiniere, Paris. France.

Also at—2, Str-Bureei, Bucharest, Roumania.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

point such that the proper relations between positive and negative ranges of relative accommodation and the convergence may be met so as to establish normal or balanced conditions? We again answer in the affirmative, and say that there should be placed before the eyes, for any given fixation and observation distances, the maximum convex or the minimum concave lenses which will just give a neutral shadow, and that we should not proceed to the point of adding such lens quantities as will produce reversal. The distance binocular findings may be inserted previous to this test, and they may be made the basis of further lenticular changes under this proposed system of dynamic skiametry until neutrality of shadow arises.

An Illustrative Case.

To illustrate: We found in a certain case the following: static skiametry, O.U. + 1.00 D.S.; dynamic skiametry, as advocated above, at thirteen inches +2.00 D.S., and for reversal +3.00 D.S. The positive range of relative accommodation at thirteen inches was found to be three diopters, and the negative three diopters. Such data show that the positive part of the relative accommodation in this case was abnormally taxed by the hyperopia present, and that, by its alleviation to the extent of 2D., a balanced condition between accommodation and convergence was established. As Donders stated, "The accommodation can be maintained only for a distance at which, in reference to the negative part, the positive part of the relative range of the accommodation is tolerably large." The foregoing data show that such was not the case. We believe, therefore, that dynamic skiametry when properly practised will afford a quick and accurate method in general of finding that lenticular assistance needed at the reading point to re-establish normal relations between the positive range of accommodation, the negative range of accommodation, and the convergence.

Furthermore, we feel rather positive from a long series of tests by various modified methods of skiametric testing, that there is always a lag, skiametrically considered at least of the accommodation behind the convergence. By this we mean that eyes practically emmetropic as far as any static or subjective tests could determine, possessed of plentiful amplitude of accommodation, fusion powers and reserves ample—in other words, as nearly physiologically perfect as could be found— have demonstrated to the writer the fact that small convex lens quantities are always accepted skiametrically, fixation and observation being in the same plane. These convex lens quantities usually remain constant irrespective of the distance of the fixation point and amount to practically half a diopter to three-quarters of a diopter before neutrality of shadows is obtained. Another method of testing is to take an emmetropic pair of eyes and have them fix a very small letter on a quarter-inch fixation card held on a thin rod, and to then determine the point of neutral shadow skiametrically. In such emmetropic eyes—or those which have been artificially rendered so, in so far as refractive errors are concerned, for some time—we have found that the neutral or reversal point is slightly farther from the patient's face than the fixation point, irrespective of the position of this point. We have designated this as a normal lag of accommodation. If this condition is universal and is not much affected by the nature of the error—and for some reasons we believe that it should not be and from other view points we are not so certain—then we should expect all dynamic findings skiametrically to be slightly greater at close points in hyperopia, and slightly less at close points in myopia, as compared with the static skiascopic findings.

We feel that this is an important point of variation in the technique and interpretation of the dynamic skiametric procedure as compared with the static method. Such a test as the foregoing may be quickly made by putting a few small letters on a strip of card about a quarter-inch wide and attaching to a fixation stand or inserting in a small carrier attachable to the phorometer rod. With the nearest emmetropic and otherwise physiologically normal eyes under test the neutral point skiametrically may be found with various fixation points, such as twenty, thirteen, ten, etc., inches. These values, converted into dioptric equivalents, represent the normal lag of accommodation behind fixation. A sample set of data is the following:

Skiametric point of reversal (inches)	Dioptric value of reversal point	Patient's fixation point	Dioptric equivalent of fixation distance
15	2.6	13	3
12	3.3	10	4
10	4	8.5	4.7

This important observation does not appear to have been recorded by others, and is of considerable significance if it proves to be correct in all particulars.

A corroborative proof of this claim may be obtained by a method to be discussed in

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

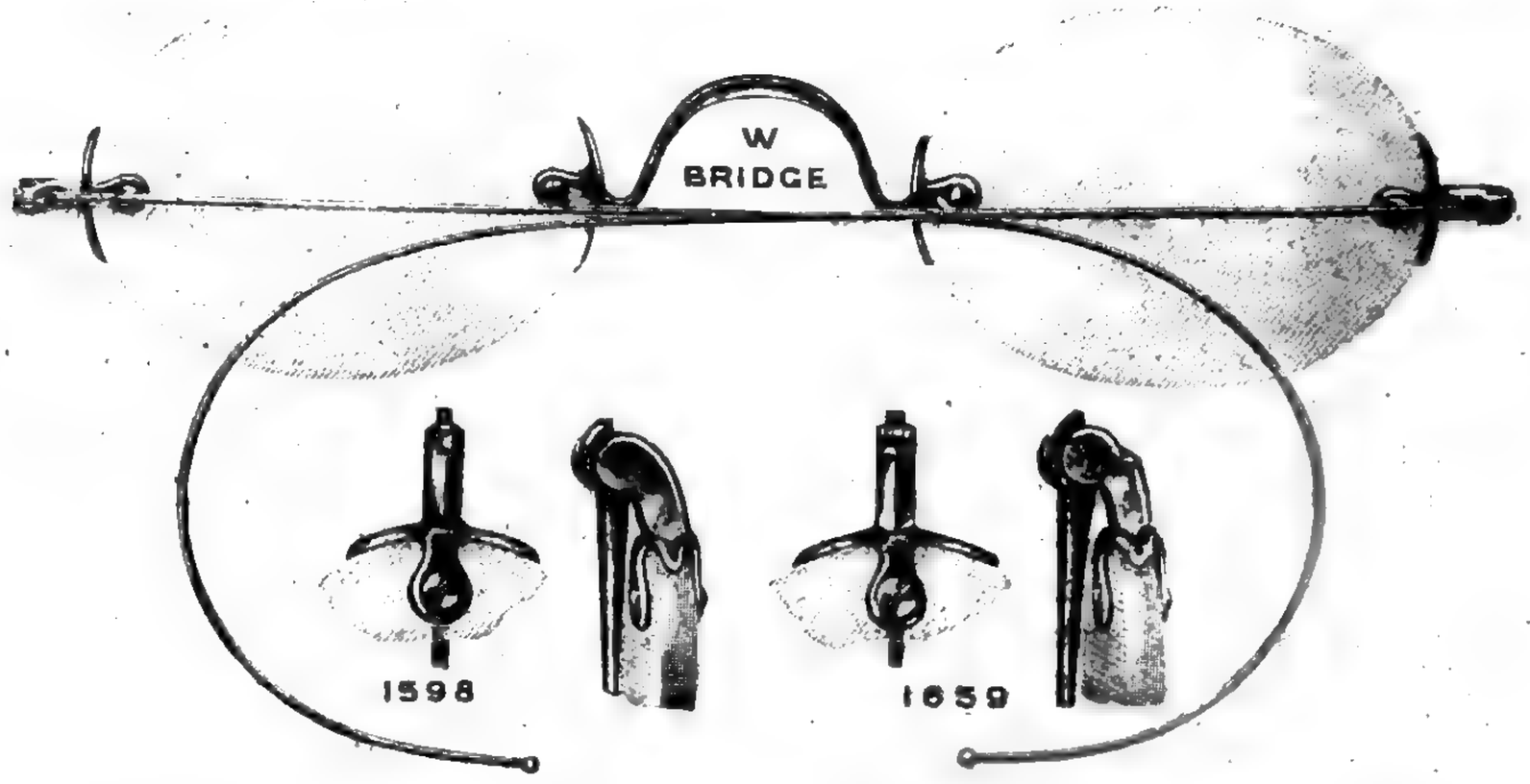
QUALITY FIRST

DUPAUL, YOUNG OPTICAL CO.,

ESTABLISHED 1888.

SOUTHBRIDGE, MASS., U.S.A.

Manufacture only Guaranteed Quality and Best Finish Gold-Filled and White Metal Spectacles, Eyeglass Frames, Astigs, Mountings and Materials.



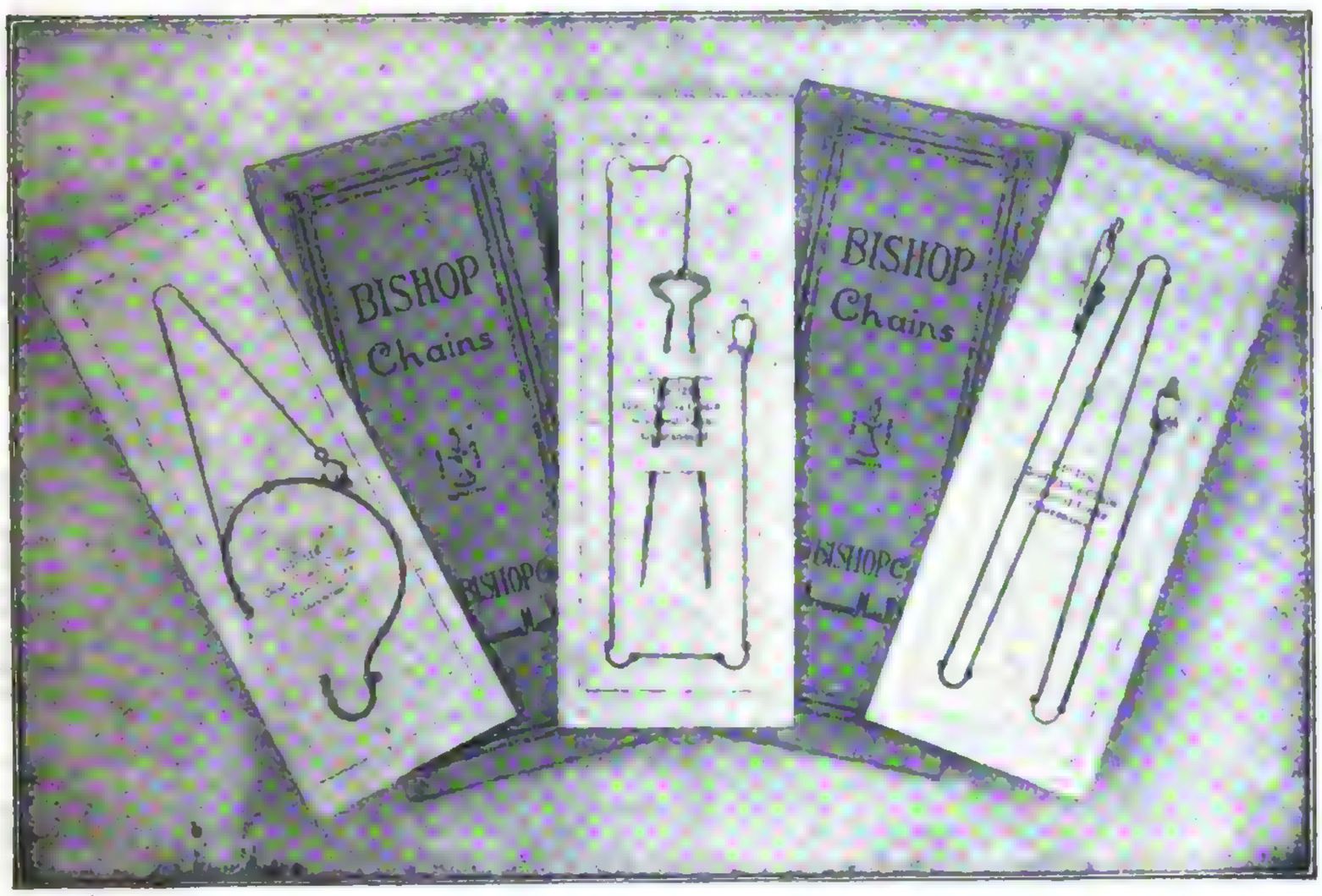
To be obtained from all Wholesale Optical Houses.

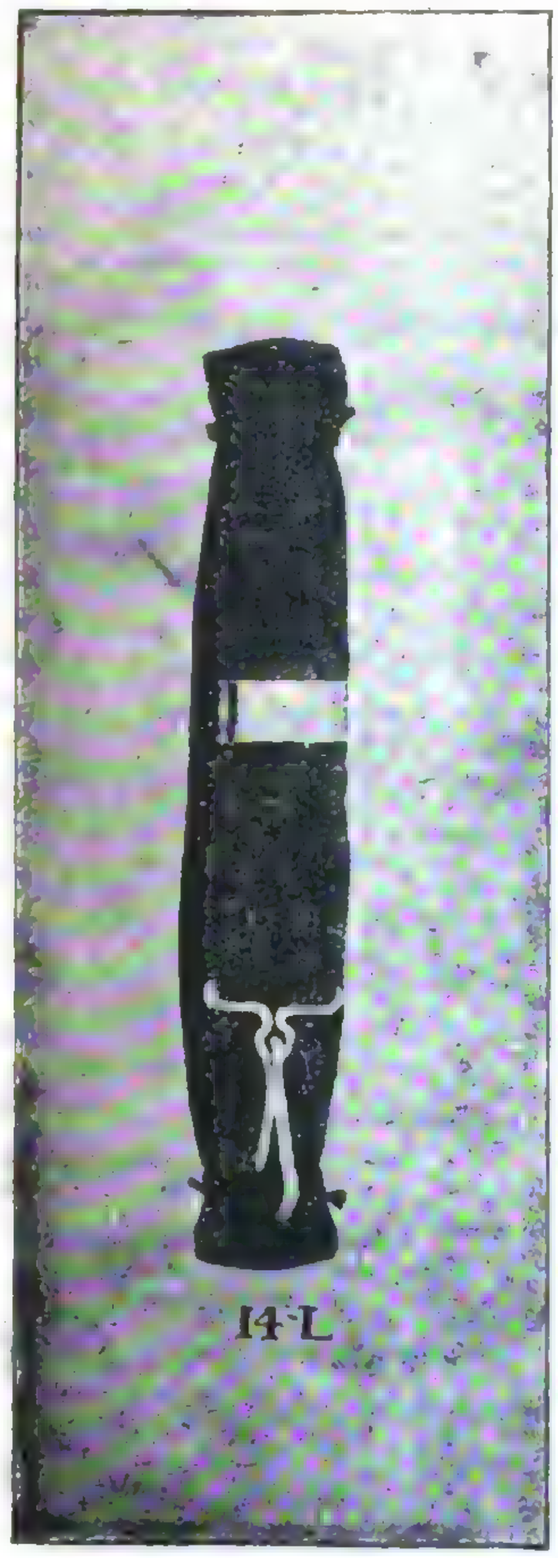
LONDON OFFICE: **S. PULZER,** 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. Telephone: CENTRAL 7241

Digitized by Google

Original from THE OHIO STATE UNIVERSITY





BISHOP CHAINS

should be your standard of Quality,
in solid Gold and Gold Filled,

BISHOP SILK EYEGLASS CORDS AND MONOCLE RIBBONS.

With Gold Filled, Silver or Gun Metal snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.



To be obtained from all Wholesale Optical Houses.

LONDON OFFICE S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

WILLESDEN IS A BIG PLACE

There is more than one Optical house in Willesden but only one W.O.W.

We are not connected in any way with other Optical concerns in Willesden or elsewhere.

Keep W.O.W. distinct in your mind.

Think of quality and W.O.W. as synonymous terms—and you are right.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY:
DUDDEN HILL LANE, N.W.10

BOURNEMOUTH.

Occupying a fine corner position in the chief Business thoroughfare.

The Important

FREEHOLD BUSINESS PREMISES

known as 128 and 130

OLD CHRISTCHURCH ROAD,

comprising an imposing building with LARGE GROUND FLOOR CORNER SHOP spacious Basement below and three storeys of Offices and Living rooms over, having good frontages to Old Christchurch Road and Fir Vale Road, also a good Double-fronted lock-up shop adjoining, facing Fir Vale Road; the whole of the actual and estimated Rental Value of

per £900 annum.

Portions of the premises are let off on short Tenancies, but

VACANT POSSESSION will be given of the Principal Shop and Basement.

HANKINSON & SON

will offer the above for Sale by Auction (unless previously disposed of) at the Central Hotel, Bournemouth, on Thursday, 8th December, 1921, at 3 p.m.

Illustrated particulars of Messrs. C. J. Smith and Hudson, Solicitors, 5, Fenchurch Street, E.C.3., or of the Auctioneers, The Square, Bournemouth, and Camberley, Surrey.

Re DIOPTRICS LIMITED.

(In Voluntary Liquidation.)

The Liquidators are offering the undermentioned stock, etc., at the prices shewn, all nett cash, subject to being unsold on receipt of orders. Enquiries are solicited as the whole will be disposed of immediately. Frames, etc , are new and in perfect condition.

198	Rough Toric Cyls. to 4D.,	at 20s. doz. prs.
35½ prs	Kryptok Toric Blanks	at 7s. pair.
43 prs	Kryptok Flat Blanks	at 5/6 pair.
55 doz. prs	Rough Cyls Plus and Minus	at 14s. doz. prs.
170 doz. prs	Uncut Sphero Cyls, 1st quality, Plus and plus,	at 16s. doz. prs.
64 doz. prs	,, ,,	Minus and Plus, at 16s. doz. prs.
63 doz. prs	,, ,,	Minus & Minus at 16s. doz. prs.
34 doz. prs	Uncut Plano Cyls. 1st quality, Plus	at 14/6 doz. pairs.
7½ doz. prs	Uncut Plano Cyls., 1st quality, Minus,	at 14/6 doz. pairs.
76 doz. prs	Uncut Sphero Cyls. 1st quality, Plus & Minus,	at 16s. doz. pairs.
92 doz. prs	Uncut Sphero Cyls., 2nd quality, Plus and Plus and Minus and Minus,	at 8s. doz. prs.
10 doz. prs	Uncut Spheres, 1st quality, Plus	at 6s. doz. prs.
70 doz. prs	,, ,, Minus,	at 6s. doz. prs.
15½ doz. prs	Uncut Menisci Minus, 1st qlty,	at 18s. doz prs.
48 doz. prs	Uncut Peris, Buffalo round, 1st quality.	at 12/6 doz. prs.
7 doz. prs	Uncut Torics, assorted, 2nd quality,	at 15s. doz. prs.
5 8/12 doz.	G.F. Folders, 1/30, 1 and 0 eye,	at 15s. doz. prs
31 8/12 doz.	S.T.O.Co., F.P. mounts, assorted guards, 1/10, 12ct.,	at 22s. doz.
13 10/12 doz.	Aristocrat F.P. mounts, 1/10, 12ct.	at 22/6 doz.
10 3/4 doz.	Consol F.P. mounts, 1/10, 12ct.	at 15s. doz.
32 doz.	D.Y.O.Co. F.P. mounts, assorted guards, 1/10, 12ct.,	at 25s. doz.
5 5/12 doz.	Itsfits mounts, 1/10, 12ct., Toggle No. 512.	at 23/6 doz.
4 8/12 doz.	Framed F.P. mounts, assorted eyes, nearly all 1/10, 12ct.	at 30s. doz.
2 4/12 doz.	Canadian Folders, G.F. 1/10, 12ct., 1 eye	at 30s. doz.
2 doz.	Canadian Folders, G.F., 1/20, 0 eye,	at 24s. doz.
163 prs.	Rimless Spec. Sides and end pieces (no bridge) 1/10, 12ct. assorted wide straps,	at 22s. doz prs
13 doz.	S.T.O.Co. R.G.C.S. heavy frames, 1/10, 12ct., 1 and 0 eye	at 32/6 doz.
11 10/12 doz	D.Y.O.Co. R.G.C.S., 1/10. 12ct., 1 and 0 eye,	at 32/6 doz.
13 9/12 doz.	Ca.O.Co., R.G.C.S., 1/20, 1 & 0 eye,	at 24s. doz
13 doz.	Shuron R.G.C.S., 1/10, 12ct., 1 & 0 eye	at 32/6 doz.
41½ doz.	D.Y.O.Co., 1/10, 10ct., R.G.C.S., assorted eyes,	at 29s. doz.
10/12 doz.	R.G.C.S. Reversible, 1/10, 10ct.	at 36s. doz.
7 5/12 doz.	R.G.C.S., assorted eyes, qualities, etc.,	at 20s. doz.
8 2/12 doz.	R.G.C.S. 1/40, 0 eye	at 15s. doz.
27 doz.	Rimless Bridges, flat, 1/10, 10ct., assorted sizes and straps	at 7s. doz.
12 4/12 doz.	G.F. Astigs., 1/10, 12ct., asstd. eyes	at 36s doz.
1 4/12 doz.	G.F. Astigs., 1/30, 00 eye,	at 20s. doz.
10 9/12 doz.	G. F. Astigs., 1/20, D.Y.O.Co.,	at 26s. doz.
2 doz.	G.F. Rimless Astigs., 1/10, 10ct.	at 16s. doz.
4 4/12 doz.	Nickel Astigs., 1 and 0 eye	at 18s. doz.
21½ pairs	Gold Rimless Spec. Sides and end pieces (no bridges)	at 96s. doz. prs.
3½ doz.	Gold Ear Chains	at 20s. doz.
1 2/12 doz.	Silver Ear Chains	at 3/6 doz.
2½ doz.	G.F. Long Paragon Chains	at 7/6 doz.
3	Auto Cl black	at 2s. each.
11 spools	Eyeglass Cord	at 3s. each.
118	R.G. Straight Side Specs., assorted eyes and qualities	at 20s. doz.
11	G.F. Callereyed Oxfords	at 8s. doz.
44	Nickel C.S. Rimless Spec. Fittings complete,	at 15s. doz.
4 doz.	Nickel S.S. Specs., 1 eye	at 9s. doz.
16 doz.	Nickel C.S. Specs., assorted eyes,	at 9s. doz.
9½ doz.	Steel C.S. Specs., assorted eyes	at 8s. doz.
5½ doz.	Steel S.S. Specs., 1 and 0 eye	at 8s. doz.
1 5/12 doz.	Steel Astigs	at 12s. doz.
13½ doz.	G.F. Frame Boston mounts, assorted eye	1/10, 12ct.,
126	Chatelaine C s, cheap	at 2/6 doz.
7 doz.	American E.C Cases	at 8s. doz.
24	G.F. Lorgnettes	at 12s. each.

Etc., Etc.

Orders should be forwarded or further particulars obtained from:—

THOS. DUTTON (Dutton Armstrong & Co.)
4, Piccadilly, Manchester.)
or G. H. LAWTON (E. Lawton & Son,
14, Brown St., Manchester.

Joint Liquidators.

Digitized by Google — Original from THE OHIO STATE UNIVERSITY

another section of this paper, having to do with an objective method of finding the amplitude of accommodation. If an operator, working with fixation and observation at one meter, adds lens quantity sufficient to produce neutral shadows at one meter, and then advances both observational and fixation points to thirteen inches, for example, demanding thereby three diopters of accommodation, then it will generally be found, either by a monocular or binocular test, that the movement of the shadow will be "with" (using the plane mirror), and that the fixation point must be kept constantly slightly inside of the skiametric observation point in order to obtain a neutral shadow. There is, therefore, evidently a physiological lag or relaxation of the accommodation amounting to about half a diopter at thirteen inches. We are not prepared to say that this lag does not change with the distance of fixation. In fact, we believe that it increases at a slow rate with increase of convergence, probably changing from about a quarter to a half a diopter at one meter, to threequarters to one diopter at eight inches.

Distance Use of Near Correction.

The most animated discussions have arisen as to whether or not the dynamic skiametric findings can be worn for distant use. In other words, the claim is made by some that the dynamic findings indicate the lenticular assistance really (or ultimately) demanded by a pair of eyes and that this method operates (from the accommodative strain rather than the total relaxation of strain method of attack) to the same purpose as does a cycloplegic—namely, the determination of the full refractive demands. Hence the two methods, although radically different in procedure and in action, look towards the same sort of an indicated answer. The static findings without the use of cycloplegics, or without careful fogging and the dynamic findings at near-points, constitute the two extreme sets of findings between which the final prescription is to be determined upon by reason of other dynamic ocular tests at distant and near-points in particular.

Other investigators claim that the findings as made by dynamic skiametry are those suitable for proper correlation of accommodation and convergence at the point fixed. They claim that the method affords a reading correction only. From a strictly scientific basis the writer believes that the latter view is, in general, the only one which can be substantiated. Hence, if a practitioner prescribes under all conditions that which leaves the visual acuity at or nearly normal, then no dynamic methods will be of any service to him. The static findings taken in conjunction with the dynamic objective and subjective tests will lead to the accumulation of data from which the practitioner, in the light of his training, his experience and his scientific study, can formulate those lens prescriptions which will serve the real demands of the ocular regime and not simply cater to V=20/20 acuity tests.

The question, "Would you prescribe from dynamic skiametric findings?" we would emphatically answer in the negative and say that we would prescribe from the results of no particular method but from the analysed results of all the methods and data obtained. In his own practice the writer uses dynamic skiametry, as a general rule, with observation and fixation at the point selected by the person under test as being the usual reading or working distance point, and then proceeds to determine the lens quantities necessary to produce neutrality of shadows. This gives as he interprets his findings, some indication of the accommodative assistance demanded at this point until the conditions of convergence, *i.e.*, whether the convergence necessary to binocular single vision be accommodative, fusional or a combination—which actually exist, without any information as to the results indicating monocular or binocular findings, *per se*. Since, in addition, he believes that there is a normal lag of accommodation of about half a diopter on the average, this amount must be subtracted from the findings in hyperopia, and added to the findings in myopia. If these findings are comparable with the static skiametric findings—then he is justified in the conclusion that static and dynamic findings are in agreement and that the function of accommodation is adequately served, that there is little latent error or spasm of accommodation, and so forth.

Comparing Results.

For instance, if static skiascopy gave O.U. +1.25 D.S., and the dynamic methods for neutral shadows at thirteen inches gave O.U. +1.50 D.S. to +1.75 D.S., this would be accepted as fair evidence of the probability that O.U. +1.25 D.S. or thereabouts would adequately serve these eyes. But if the dynamic findings were in radical disagreement with the static skiascopic data, then a condition of presbyopia, sub-normal accommodation, latent hyperopia, spasm of accommodation or latent convergent squint might be suspected. For instance, if static skiametry gave O.U. +1.25 D.S., and the dynamic findings gave O.U. +3.00 D.S., for neutral con-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

ditions at fourteen inches, there would be suspected one of the conditions just cited and the operator would proceed to carefully investigate the case.

There may be and doubtless are ocular conditions in which dynamic skiametry fails to give data of much value. In high anisometropia, for example, it may happen that one eye will carry on the function of vision at the reading point, the vision in the other eye being suppressed and not functioning, hence dynamic findings on the fixing eye would be of value, but of no significance with respect to the non-fixing eye. Such a condition is likely to arise when one eye is hyperopic and the other myopic. But again, in a case of anisometropia, in which both eyes are hyperopic but one much more so than its mate, the act of binocular single vision may be enforced and accommodative action take place in each eye to the same extent. Then the dynamic findings on these eyes will be equally valuable in the determination of the lenticular assistance that each eye needs at the point of fixation.

[To be concluded.]

Sixty Years of Electrical Progress.

Life in 1861 must have been very different from existence in 1921. Women's dress was voluminous. Men wore beards and top hats, when playing cricket. The broad gauge railway flourished. Ships were still built of wood and bridges of cast iron. The "Great Eastern" was the last word in marine construction. Candles, oil lamps and flat flame gas burners were the means of artificial lighting. Sky signs were unknown, as were trams and motor omnibuses; even horse 'buses and hansom cabs were wildish novelties. It took weeks to communicate with America and India; and there was nearly war with the former owing to the lack of a telegraphic cable between the two countries. The history of *The Electrician*, which first appeared on November 9th, 1861, and this week celebrates its Diamond Jubilee, is therefore, the history of a great change no less in technical journalism than in electrical engineering. In those sixty years it has recorded such inventions and commercial enterprise as in 1880 made electric lighting possible, and later spread a network of supply mains through all our large cities. In 1890 it marked the genesis of electric traction on the City and South London Railway. It has seen the invention of the telephone and the widespread adoption of the electric motor for industrial purposes. The Diamond Jubilee Issue of this leading electrical journal contains historical and technical accounts of the development of telegraphic and other electrical applications since 1861.

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

Early Sight Testing.

Sir,—Towards the end of the second paragraph of Mr. Staunton's letter regarding the early history of the sight-testing optician, published in your issue of 28th ultimo, he states:—"When Mr. Henri left Bateman in 1882 and opened in Newgate Street, Mr. Aitchison went with him."

The sentence above quoted is not in accordance with the facts, which are, that Mr. Henri left the Cheapside branch of Mr. J. Bateman early in 1882, starting soon afterwards in business in Old Bond Street.

Mr. Aitchison continued with Mr. J. Bateman in the Strand branch, until the completion of his apprenticeship some six months later, when he went direct to the well-known firm of Messrs. Chancellors, the Dublin opticians.

Early in 1884, after about fifteen months' absence in Ireland, Mr. Aitchison returned to London, to re-join the firm of Mr. J. Bateman; and it was then that I first made his acquaintance and was in daily contact with him until 1888.

Meantime Mr. Henri transferred his business to Newgate Street, and still later, in 1885, to Aldersgate Street.

In 1888, Mr. Aitchison left Bateman's, joining Mr. Henri in Aldersgate Street, whom he left a few months later, in the spring of 1889, to start in business at 47, Fleet Street.

Mr. Aitchison mastered the business of a sight-testing optician as completely as was possible with the facilities afforded in those days; during his five years' apprenticeship, his experience in Dublin and his experience on returning to Bateman's. He certainly had no business relationship with Mr. Henri until 1888.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



CHEMICO CLEERVIEW

EVERY SPECTACLE USER NEEDS IT —

is the invention of a Spectacle user who realized that sight might be considerably improved by the

SCIENTIFIC CLEANSING

and polishing of the lenses of

SPECTACLES, EYEGLASSES, Etc.

IT RETAILS AT ONE SHILLING.

Polishing the lenses by the usual method with the pocket handkerchief does not give that clear view and power of which the glasses are capable.

EVERY OPTICIAN SHOULD STOCK IT —

In the atmosphere in which we live (both indoors and outdoors) are greasy, tarry products which deposit themselves on the glasses and **"BLUR"** the sight.

SAMPLE SENT FREE ON REQUEST

These products are not soluble in water and are not removed by the handkerchief.

BIG BUSINESS IS BEING DONE —

CHEMICO CLEERVIEW

is a perfect cleanser and polisher and has also the peculiar property of preventing fogging and steaming.

BUT BIGGER BUSINESS IS COMING —

WRITE FOR LITERATURE AND TRADE TERMS.

THE COUNTY CHEMICAL Co., Ltd., Chemico Works, Birmingham.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



Finger Piece Supremacy

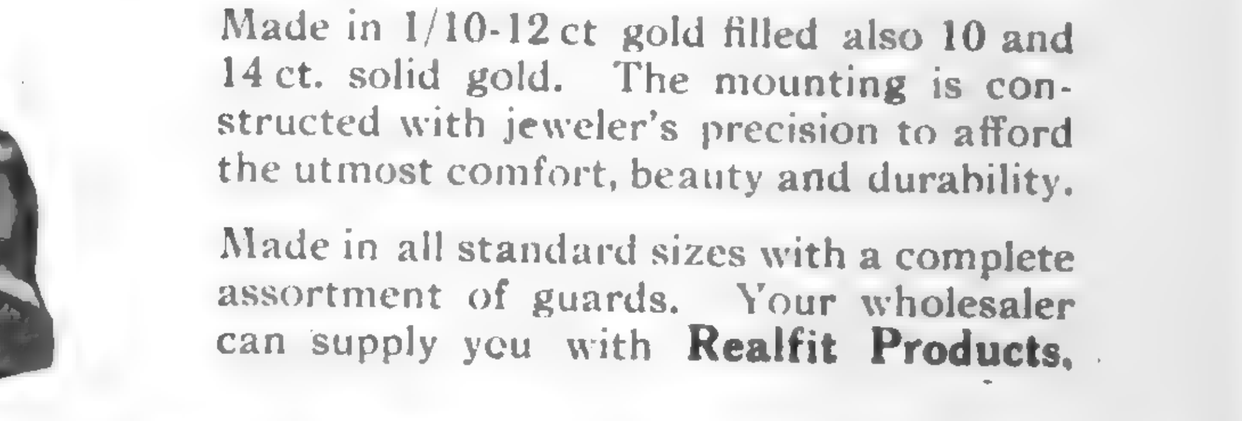
Finger piece Mountings and Frames have always been our specialty. Our original Finger piece line, which we named **Realfit,** became so popular with the optical trade that we recently adopted the name **Realfit** for all our products.

No finger piece mounting on the market gives longer wear or greater satisfaction.

Made in 1/10-12 ct gold filled also 10 and 14 ct. solid gold. The mounting is constructed with jeweler's precision to afford the utmost comfort, beauty and durability.

Made in all standard sizes with a complete assortment of guards. Your wholesaler can supply you with **Realfit Products.**

REALFIT *Finger Piece.*



NEW JERSEY OPTICAL Co.,
Newark, N.J., U.S.A.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Mr. J. Bateman was at one time London's largest optician, having two branches in Fleet Street and two in Holborn, in addition to those above referred to. Although there were no actual rooms for sight-testing in the firm, the branches were elaborately fitted and well equipped with trial cases, trial frames, optometers and refraction tests. These were all in regular use, and in my experience, astigmatism was often corrected, after careful sight-testing, even in those early days.

FREDERICK W. BATEMAN.

55, Berners Street, W.1.

Sir,—Your correspondence on early sight-testing is very interesting.

It would also be of interest to know what examining body existed in Calcutta in 1879. Perhaps, Mr. Braham can give us details.

'NOTROM.

The National Association of Opticians.

Sir,—In writing these lines I do so in no hostile spirit towards the N.A.O. or its new proposals, but simply for the ultimate benefit of British optometrists. Whilst admitting that any society has a perfect right (unless limited by Charter) to institute any examinations for aspirants to membership, yet I do not think that such an examination should be held forth as a qualification in visual optics and sight-testing.

Perhaps the Secretary of the N.A.O. will give us some enlightenment on the matter.

Is this an idea of levelling up the ophthalmic profession of optometry? If so, are all the members of the N.A.O. to submit themselves to this examination? If not, where does the levelling up come in? Or, is this examination to be of a much higher standard than the existing and recognised examinations of the S.M.C. and the B.O.A.

One thing is certain, and that is this, that when the British Parliament considers things pertaining to visual optics and optometry, it will consider the safety of the British public before the vested interests of sight-testing opticians of all grades.

This is as things should be, even as far as sight-testing is concerned, and when one considers the close association of the eye with the central nervous system, and the reflex actions of even small errors of refraction on the general health, I do not think it the proper procedure to institute any examination of a lower standard than those of the B.O.A. and S.M.C.

The crux of the whole question, as far as opposition from medical and scientific circles is concerned, will be the ability of the optometrist, not only to test sight, but to recognise diseased conditions, and conditions needing medical or surgical treatment, by means of the ophthalmoscope and perimeter. Personally, I think there is absolutely no excuse for anyone who wants to be qualified by examination, not taking the recognised examinations.

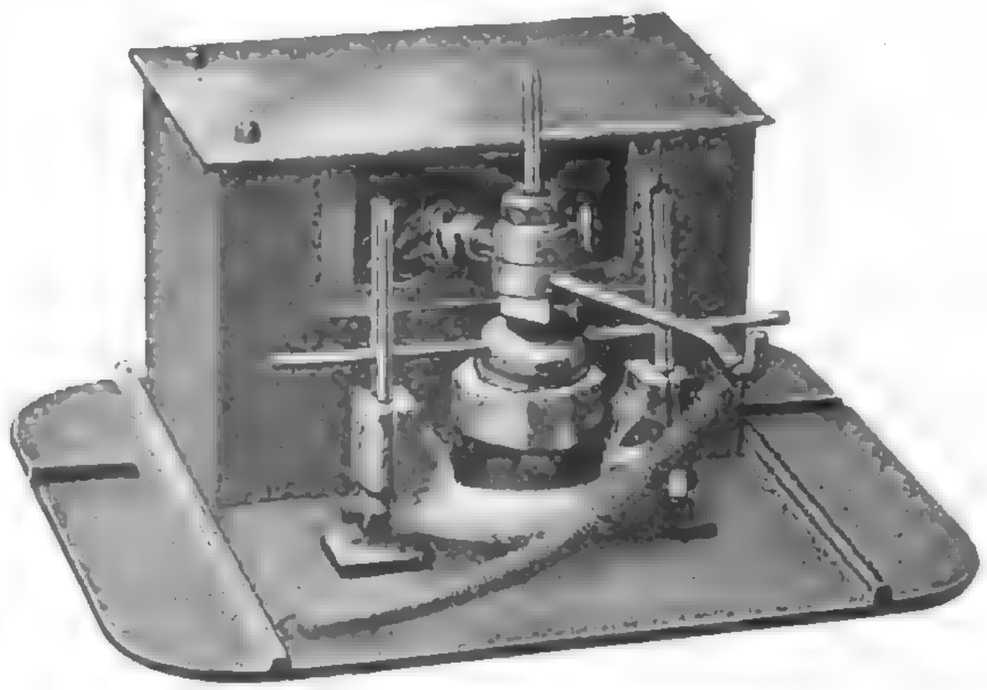
Even if a man has only a small practice or of very little value, surely the eyes of his clients should be considered, or he should cease sight-testing.

The man who has a big practice on the other hand, who always talks about his loss of business if away, and having no time, is absolutely without excuse, as I do not think that there are any other examinations in existence where so little absence from one's business is required. There is no forced curriculum at any school of visual optics, and all one requires is a few year's correspondence course, and a few weeks at a good school prior to the examinations.

ORTHODOX.

The "Somco" Toric and Cylinder Machine.

The mechanism of this newly patented machine, which we illustrate, is so designed that the path traversed by the lens upon the surfacing tool or polisher includes two movements at right angles to each other, compounded in an arcuate path. Owing to the



continually varying directions of movement in both major and minor axis of the ellipse described by the lens or lenses, the work is smoothed and polished in a very short time. Moreover, the lens when removed from the machine is entirely free from wave—a point which will be appreciated both by manufac-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

turer and operator. The machine is very small in size, no larger, indeed, than an ordinary typewriter; but, although occupying such small space, is very solidly built. The bearings are of specially good proportions, and all spindles and gears are of steel. The mechanism is entirely enclosed, so that no emery or other abrasive can affect the working parts. A noteworthy feature in the sale of this optical surfacing machine is the guarantee given by the makers—a guarantee absolutely unconditional as to all parts of the machine for six months from date of purchase. All parts are made on the interchangeable system, and a chart is supplied with each machine sold, so that in the event of any part wearing out or needing replacement from any cause, it is only necessary to state the number of the part according to the chart provided, and another to take its place can be sent immediately, and fixed in position by anyone with very slight mechanical knowledge. The "Somco" machines are London made throughout, and all information is to be had from the manufacturers, the Surgical and Optical Manufacturing Co., 22, Union Road, S.W.14.

The National Association of Opticians.

A meeting of the Executive Committee of the N.A.O. was held at Liverpool on the 19th ult. There were present Messrs. A. Hershberg, J. W. Oberle, D. R. Jones and E. Moevius. Apologies for inability to attend from Messrs. J. W. S. Green, H. W. Daykin and L. Moreton Parry were received. The President, Mr. A. Hershberg was in the chair.

Among the correspondence was a letter of a satisfactory nature from Mr. Chas. Hyatt-Woolf in reply to a letter *re* the pseudo-news advertisement in *The Optician* of a few weeks ago.

After several accounts were passed for payment, in the absence of the Treasurer, Mr. H. W. Daykin, the Secretary stated the finances were in the usual sound condition; and that applications for membership were constantly coming in.

The applications for membership were then duly considered, and of them the following were elected:—Messrs. R. F. Parker, 29, King Street, Lancaster; W. Sage, 12, Bassingham Road, Wandsworth, London, S.W.18; H. F. Gage, 28, Arundel Square, Barnsbury, London, N.7.; W. H. Jones, 66, Penny Street, Lancaster; W. Chadwick, 5-7, Station Road, Barnoldswick, and G. K. Jones, 10, Longbridge Street, Llanidloes.

A Manchester Lecture.

At the Medical School, Manchester University, Mr. J. S. D. Stopford, M.D. (University Professor of Anatomy), will lecture to opticians under the auspices of the British Optical Association, on "The Visual Pathway from the Eye to the Cerebral Cortex," on the 7th prox., at 8 p.m. Fee 2s. 6d.

A Pamphlet on Frame Fitting.

Some frame makers trade lists are of special interest and usefulness to retail ophthalmic opticians, because apart from the commercial aspect of the particular series of fittings described, they give instructive practical hints on methods of measurement—as for instance, correlating the methods of taking bridge measurements, in connection with size of "eyes" and pupil distance. Such a list is the pamphlet issued by the Optical Products Co. (86, Worcester Street, Birmingham), dealing with "Orbito spectacles and how to fit them." The booklet opens with this statement, "It is generally recognised as a fact that to fit a saddle or W. bridge spectacle perfectly is more difficult than many opticians imagine. Anyone with only a little experience can fit such a frame, and are inclined to think it quite an easy operation; few, however, get perfect results. (To test sight is easy; to precisely correct faults in refraction is another matter altogether), and so with frame fitting." The illustrations and details of measurements to be made for correct fitting, given in the body of the pamphlet, are calculated to be very helpful to a spectacle fitter; and we would recommend that in this, as in every like instance, the manufacturers' suggestions on methods of recording the measures for a prescription order should be studied by the ophthalmic optician.

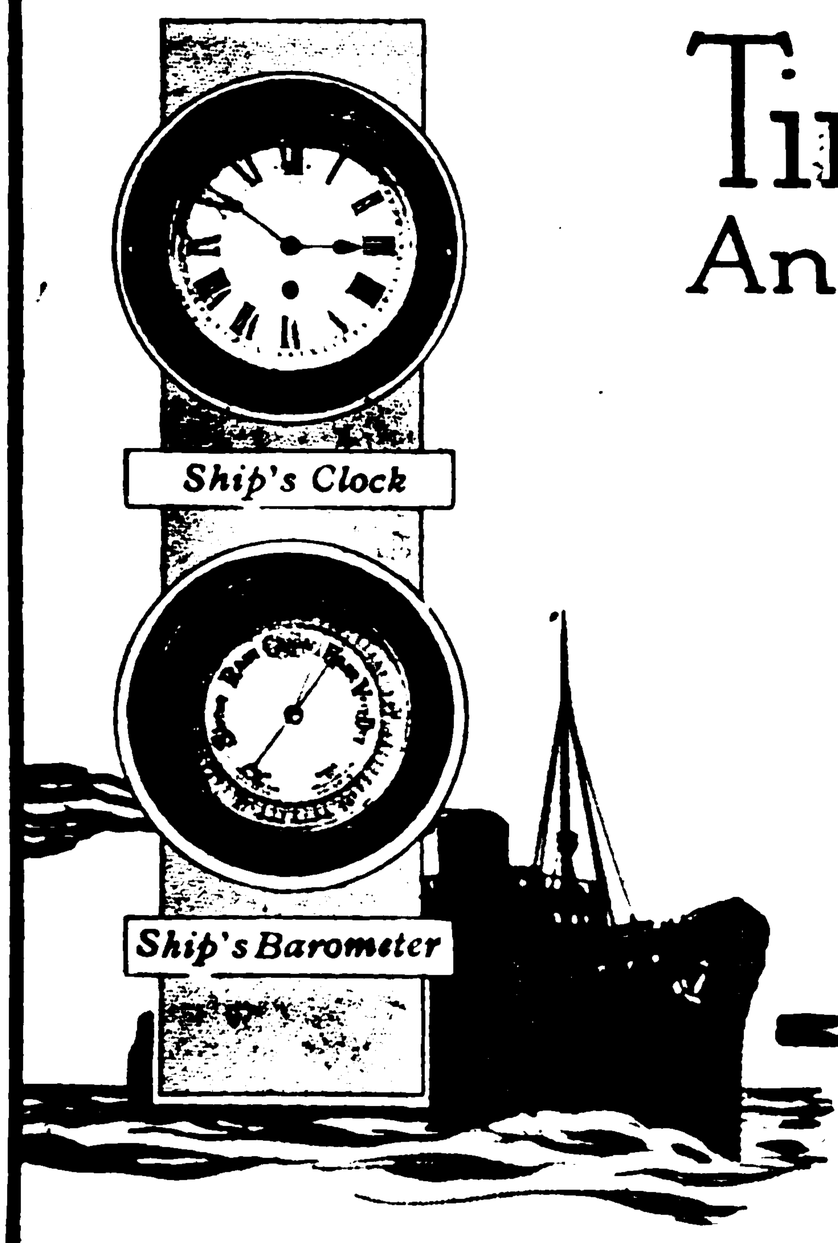
Another pamphlet that has been got out by Mr. A. J. Harrison, the inventor of "Orbito" spectacles and pinces-nez, is an attractive piece of counter literature entitled, "How famous men preserve their working efficiency (with portraits)." The introductory paragraphs of this state "The Lord Mayor of London said that the discoverer of the secret of making spectacles was one of the great benefactors of the human race. That is strikingly true,

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

T. A. R. & Co.

"THE ALL BRITISH HOUSE."

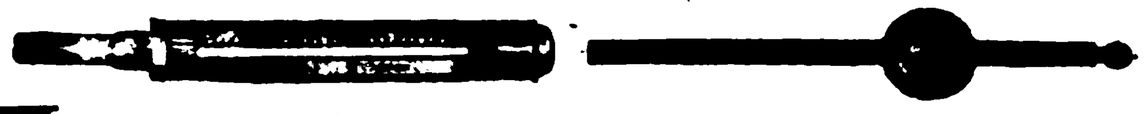
Over 2,000 Designs in Aneroid Barometers.



Time and Tide
And Ship's Instruments



T.A.REYNOLDS & CO
40-1-2 PERCIVAL STREET,
LONDON E.C.1



Steam-pipe Thermometer *Hydrometer*

Telegrams—
"THERBAROME. LONDON."

Telephone—
339 CITY.

Showrooms and Offices at above address.

If you are a Retailer and need ORIGINAL LINES in Barometers, Clocks and Thermometers, write us, and although we will not supply you direct, we will put you in touch with the Nearest Wholesale House.

WHOLESALE AND SHIPPING TRADE ONLY.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

SCIENTIFIC
INSTRUMENTS.

ACTUAL
MANUFACTURERS.

"SOMCO"

OPTICAL MACHINERY and TOOLS.

SURGICAL & OPTICAL MFG. Co.,
22, Union Road,
CLAPHAM, LONDON, S.W.

OVERHAULS
and REPAIRS

ENQUIRIES
SOLICITED

GOLD FILLED & NICKEL GOODS
ALSO
UNCUT LENSES
AT ASTONISHINGLY LOW PRICES.
QUALITY AND FINISH GUARANTEED.
SEND FOR PRICE LIST.

OUR RX DEPARTMENT IS UNEQUALLED FOR PROMPTNESS & ACCURACY.

Telephone:
HOLBORN 1620
(Private Exchange).

KIRK BROTHERS
WHOLESALE & MANUFACTURING OPTICIANS

Telegrams:
KIRBROREX, HOLB.
LONDON.

36, GRAY'S INN ROAD, LONDON, W.C.1

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

both for the individual and the race. The wearer of spectacles receives immense direct benefit—and the world at large is also benefitted, indirectly, by his prolonged efficiency for work. This applies to everyone who wears glasses, but its importance is best realised by reference to the famous personalities herein shown—whose work is of great value to the generation." The general nature of the pamphlet will be understood from these remarks; but in addition it contains some illustrated and concise descriptions of the various forms of error of refraction.

Trade Topics.

At the next meeting of the Optical Society (on the 24th inst.), Prof. F. J. Cheshire, C.B.E., will lecture on "The Polariscope, from a Historical Standpoint."

To lessen the danger of eye-strain, Blackburn kinema licensees, says Dr. Daley, the town's medical officer, have agreed to exclude young children from the first few rows in the auditorium.

During this month, the British Optical Association is holding a series of lectures on retinoscopy, ophthalmoscopy, keratometry, perimetry and phorometry, etc., at Clifford's Inn Hall, London, E.C.4.

Dr. J. P. Higham will lecture on the evening of the 24th inst., before the Institute of Ophthalmic Opticians (Staple Inn Buildings, W.C.1.), on "Glaucoma." The lecture, which commences at 8 p.m., will be illustrated by lantern slides.

Owing to the bad state of the ground, the Bondwell F.C. did not play their match with the Albion F.C., at Hampstead, on Saturday, November 5th. Next Saturday, the "Bees" are at home, Lea Bridge Road, to the Urswick Athletic F.C. As a keen game is anticipated, all supporters are cordially invited.

There will shortly be published by the Department of Overseas Trade, a review by Mr. T. M. Ainscough, O.B.E., His Majesty's Senior Trade Commissioner in India and Ceylon, of the conditions of British trade in India during the years 1919-20 and 1920-21, revised to October, 1921, and the prospects for the future.

At a meeting of the Durham and Cleveland Optical Society, held on the 26th ulto., Mr. J. P. Higham, B.A., M.B., gave an address on "Diseases of the Conjunctiva and Cornea." This month, Mr. Harry Taylor is to lecture on "Some Details in Frame Fitting"; and in December, Dr. A. S. Percival, of Newcastle, will deal with "Prisms, Decentration and Bifocals."

Messrs. Short & Mason's announcement in our last issue (page xi) contained an error which was entirely the fault of our printer. The word "barograph" was misspelt. The reliability and world-wide reputation of Messrs. Short & Mason's scientific instruments makes it very inappropriate to have such a misprint in the advertisement of their well-known barographs; and we regret and apologise for our responsibility for the mistake.

The next lecture for the members of the British Optical Association will be held at Clifford's Inn Hall, at 8.15 p.m. (instead of at 8 p.m.) on Thursday, November 17th, when Dr. Sheard, the Research Editor of the 'American Journal of Physiological Optics,' will address the members on the "Prescription of Prisms" in actual practice. As this date clashed with that fixed for the lecture by Dr. Higham at the Institute of Ophthalmic Opticians, the Council of the Institute have postponed their lecture until the following week. Members of the Institute are cordially invited to attend the lecture on November 17th, at Clifford's Inn.

Marriage of Mr. Wm. H. Baird.

We have been favoured with a call from Mr. Wm. H. Baird, son of Mr. John Baird, of the Herald Optical Works, 68 and 70, Mitchell Street, Glasgow. Mr. Baird Junr. has just recently (on the 28th ult.), taken unto himself a wife. The happy couple are at present spending their honeymoon in London. Mr. Baird has been taking an active part in the management of his father's business since his demobilisation about 2½ years ago.

New Companies.

John Trotter, Ltd.—Private Company. Capital, £12,000 in £1 shares. To take over the businesses of opticians, carried on by J. Trotter, at 40, Gordon Street, Glasgow. The first directors are:—J. Trotter and J. Trotter, Junr. Qualification, £100. Registered Office: 40, Gordon Street, Glasgow.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Prefix is alright but what really counts is

THE SUFFIX

Crookes glass dates back to say 1913, and made by anyone is original and genuine, but it is important to remember that applies only to Sir Wm. Crookes A and B Glass. Since that date much water has flowed under London Bridge and Sir William only ceased his labours when he brought out his *Ultimate* Glass—the result of his long years of research. The only genuine Crookes Ultimate is made by—

SIR WILLIAM CROOKES ULTIMATE ANTI-GLARE GLASS CO., LTD.,

30, WIGMORE STREET, LONDON, W.

REMEMBER THE SUFFIX—ULTIMATE.

FINEST

ROUGH CYLINDER BLANKS,

Also good 2nd Selection
A very attractive proposition
for Export and cheaper work.

CHANCE'S GLASS USED.

ACTUAL MANUFACTURERS

ASSOCIATED OPTICAL WORKS, Ld.

5, Queen's Buildings, London, W.1

Near Tottenham Court Road.

No Connection with any other Firm. Telephone: Museum 2216.

RADIUM COMPOUND

SELF-LUMINOUS.

Highest Possible Efficiency, Durability and Value.

As supplied to H.M. Government, &c.
Guaranteed to pass N.P.L. requirements.
All Grades in stock, from 15/- per gram.
RADIUM SALTS TESTED AND CERTIFIED.

F. HARRISON GLEW THE RADIUM LABORATORY.

156, Clapham Road, London, S.W.9

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,

DANDURAND BLDG., MONTREAL.

Cable "Optical" A.B.C. Code 5th. Edition.

F. BARKER & SON, LTD.

SUNDIAL HOUSE,

12, Clerkenwell Road, LONDON, E.C. 1

Registered London

Trade Mark

Estab. 1848

MANUFACTURERS OF ALL CLASSES OF

SCIENTIFIC AND OPTICAL GOODS.

MANUFACTURERS OF

Aneroid Barometers, Compasses, Drawing, Mining, Surveying & Scientific Instruments of Every Description.

Illustrated and Descriptive Catalogue Post Free to any part of the World. Illustrated Booklet upon Sundials, Barometers and Compasses, Post Free. LISTS FREE.

Correspondence Invited. Bankers' and Trade References.

CLINICAL THERMOMETERS A SPECIALITY

THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER

Subscription Form. **123-125, Fleet Street, London, E.C.4., England.**

Send a copy each week of THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER post free for which we enclose .....shillings for.....weeks.

UNITED KINGDOM 17s.

and ABROAD 20s.

Name.....

Business.....

Address.....

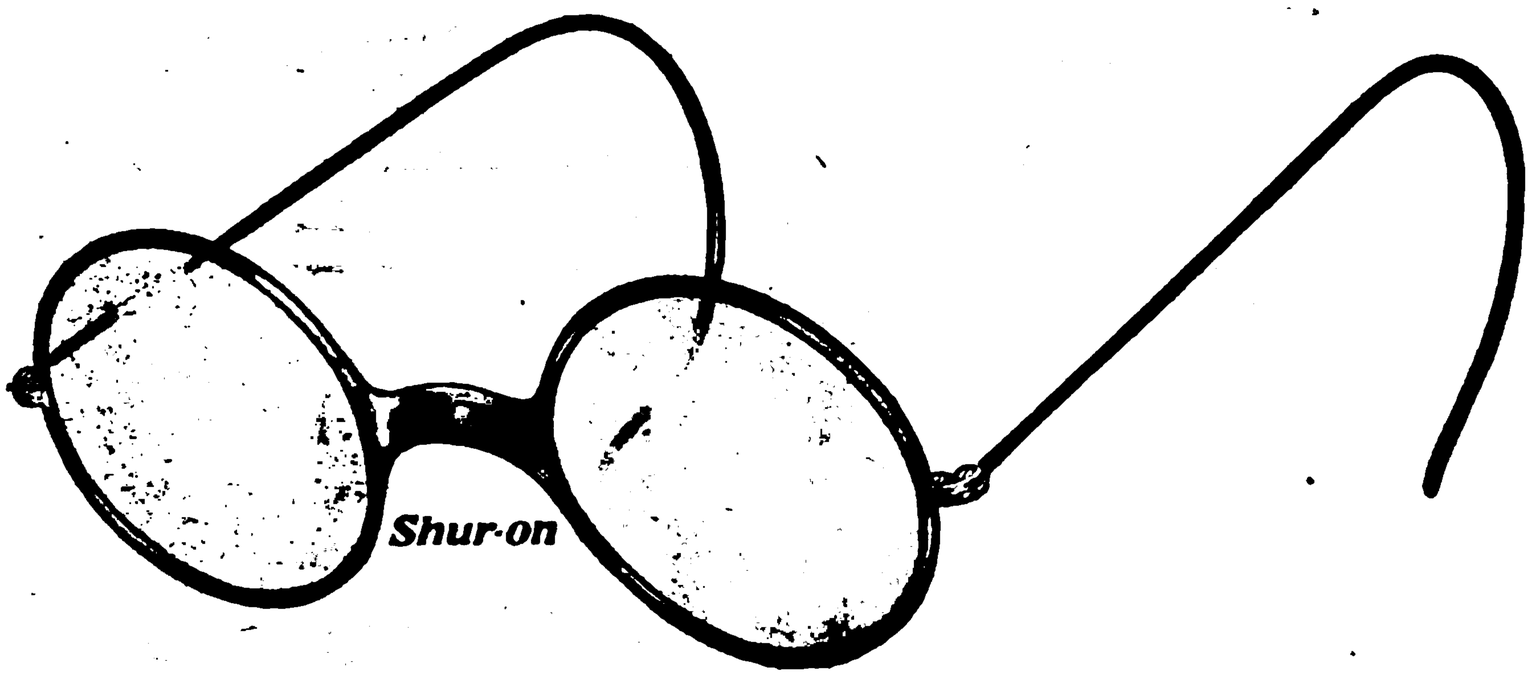
.....

A remittance of 17s. (or 20s. Abroad) for 52 issues includes "THE OPTICAL ALMANAC" post free.

Cheques made payable to The Hatton Press Ltd.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Shur-on Glasses



Here's a Ready Seller.

A NEW SHELLTEX SHUR-ON—Lightweight! Smart, distinctive, practical. Just what you've wanted for the small, hard-to-fit features. It's as becoming as it is practical, as dependable as it is "Quality Beyond Question.". Has a solid, lightweight, Shelltex front—a beautiful cherry—a regular Shur-on End Piece and a No. 5 Temple, metal lined, all expertly fashioned and finished. In all the wanted P. D.'s and bridge measurements. Stock this popular Shur-on.

If your wholesaler cannot supply you, send us his name.

Shur-on Optical Co..

Rochester, N.Y. U.S.A.

Quality Beyond Question Since 1864

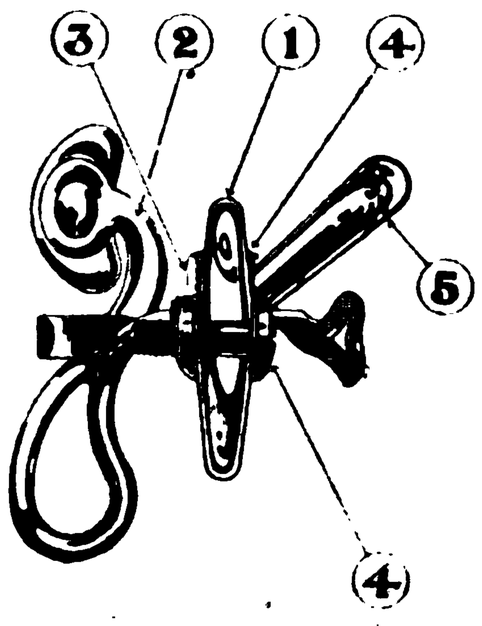
Digitized by Google

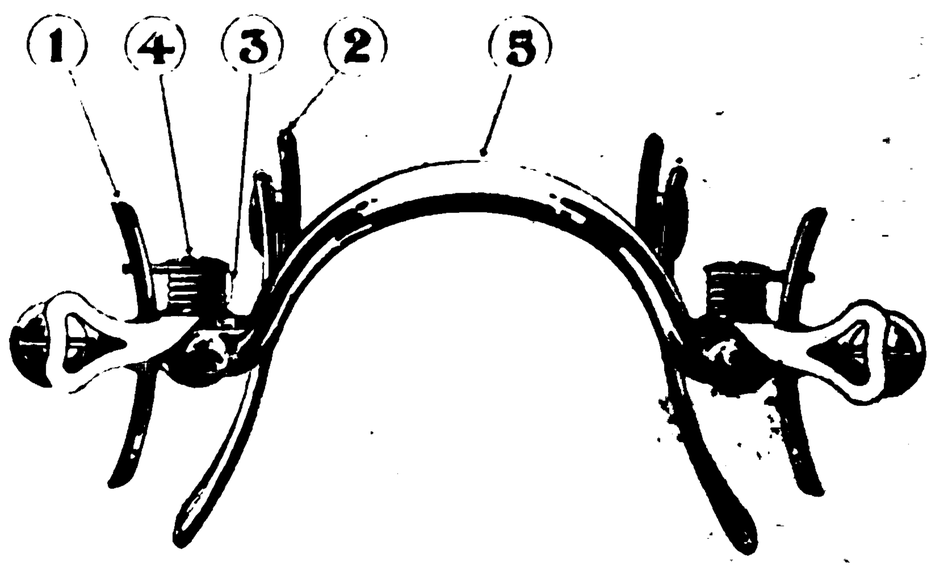
Original from THE OHIO STATE UNIVERSITY

TENNYSON OPTICAL PRODUCTS.

BRITISH MANUFACTURE.

THE FIRST T.O.P. PRODUCTION.





1.—STRAP. Supplied from 1½ to 5 m/m widths in ½ m/m variations. Each dimension is exact and the strap holds the lenses at the right plane to the eye in relation to the bridge.

2.—GUARDS. These are provided with movable top to prevent friction in wear and are adjusted so as to maintain a level and even balance.

3.—SPRINGS. A lever movement of the springs is located centrally, and the springs are so tempered that an equal pressure is given and maintained by either guard.

4.—SCREWS. The screws are specially made with a thread that will not allow them to work loose, resulting that lenses are firmly held.

5.—BRIDGE. The bridge is supplied in 27 Fittings, so that any type of nose may be fitted with accuracy and comfort.

THE "PRINCE" FINGERPIECE MOUNT.

This is, by common consent of leading optical authority, a finer production than any similar foreign article. In design it possesses points of distinct superiority, while in finish it conforms to the very highest standards, and is characteristic of British thoroughness in manufacture. You are an expert, consider its features indicated in the above enlarged diagram. This is a typical T.O.P. Line, and is designed upon a type which we feel represents the present trend of public choice.

ORDER THROUGH YOUR WHOLESALER.
THE "PRINCE" FITTING SET.
We shall be pleased to send you T.O.P. Illustrated Catalogue on application.

OPTICS Ltd.,
TENNYSON WORKS, WILLESDEN LANE, LONDON, N.W.6

WHOLESALE AND EXPORT ONLY

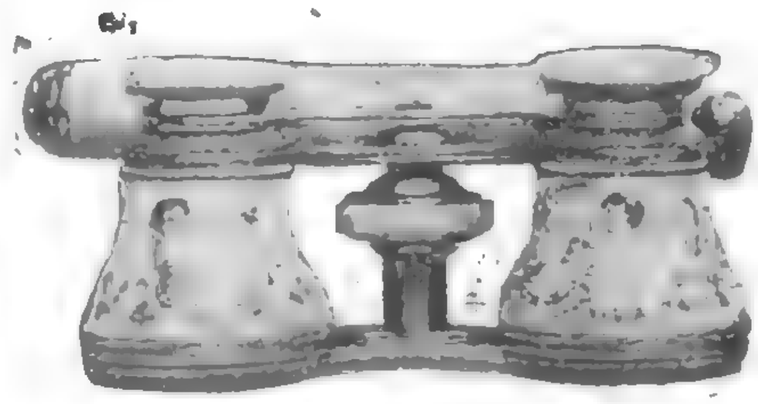
GUARANTEED BRITISH MANUFACTURE PRODUCTS

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

SPECIAL NOTICE.





We hold Large Stocks of OPERA GLASSES in ordinary and Handle patterns, with Morocco Covered, Pearl or Enamel Bodies.

As these were bought before the Key Industries Bill became Law and when the Rate of Exchange was greatly in our favour, we can offer our present stock at exceptionally Low Prices.

We also hold large stocks of FIELD GLASSES, TELESCOPES, MICROSCOPES, PRISM BINOCULARS, etc., etc., which are Splendid Value.

Full particulars and prices will be sent on application.

JOHN BAIRD,
Manufacturing Optician,
Telegrams: "SPECTACLES, GLASGOW."

"HERALD" OPTICAL WORKS,
68 & 70, MITCHELL ST., GLASGOW.
Telephone: CENTRAL 541.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d. per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

BARGAIN. Shop soiled Standard lens drilling machine. Last one. F. Goodman, Chatsworth Road, Luton.

AUSTRALIAN OPALS. Direct from Australia. Sing'e stones or quantities. Beautiful colours. Lists free. Optical goods or scientific instruments in exchange. Correspondence invited. Seward, Optician, Melbourne, Australia.

FOR SALE. Fine 4-prism Browning Spectrometer in perfect condition. Complete with three eye-pieces, and all accessories. Can be inspected in London by appointment. Reply, Box 3486, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

SMALL wholesale optical factory for sale within two minutes of Farringdon Street Station. Completely equipped motor-power, stones, benches and frame-making plant. All in first-class working order. Apply, Box 3498, c/o "The Optician," 125, Fleet Street, E.C.4.

ADVERTISER would purchase small sight-testing business. Write, Box 3499, c/o "The Optician," 125, Fleet Street, E.C.4.

OWNER of old-established optical glass manufacturing business in South Yorkshire, recently converted into private limited company, desires to realise his shares for £3,500 or near offer or to halve same with gentleman, preferably one having optical knowledge or sound business training. Apply, Moorwood, Solicitor, 19, St. James' Street, Sheffield.

Employment Bureau. *Concluded from page 6*

GOOD All-round gold worker, frame and rimless, or representative for wholesale firm, excellent references. Box 5738, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. first assistant, desires change. Capable refractionist, also fully practical. North preferred. Particulars and salary to Box 5737, c/o "The Optician," 125, Fleet Street, E.C.4.

The Optical Society.

President: Mr. R. S. Whipple, M.I.E.E.
Vice-Presidents: Prof. Frederic J. Cheshire, C.B.E., Director of the Technical Optics Department of the Imperial College of Science and Technology, South Kensington; Sir Herbert Jackson, K.B.E., F.R.S.
Hon. Treasurer: Mr. I. G. Aitchison, B.A., LL.D.
Hon. Secs.: Mr. L. C. Martin, B.Sc., Imperial College of Science and Technology, South Kensington S.W.7 and
Papers' Secretary: Mr. F. F. Bryson, M.A., B.Sc.

The Society of Chemist-Opticians.

President: Mr. F. S. Horsey
Vice-Presidents Mr. Fouracre.
Hon. Secretary: Mr. J. Harcombe Cuff, Friern Barnet Rd. New Southgate, N. 11 Telephone Finchley
THE SUPPORT OF ALL CHEMIST-OPTICIANS IS EARNESTLY INVITED.

INDEX TO "THE OPTICIAN."
Volumes 45 to 57.
Price 6d. each. Post free from
"The Optician," 125, Fleet Street, London, E.C. 4

RETAILERS who appreciate
PERFECT RIMLESS FITTING,
no loose screws—exact Measurements
Send to:
ROWLEY & Co.,
Deansgate, BOLTON.

DOING YOUR OWN EDGINGP
Write us for
UNCUT TORICS.
Remarkably Low Prices.
APEX OPTICAL Co., Kidderminster.

D.B.O.A. and F.S.M.C.
Tuition by post under Expert Tutors. Courses for Diploma Examinations. Short period classes before each examination are given at Manchester. Residence provided.
Apply for particulars to Secretary.
PENNINGTONS, University Tutors, 254, Oxford Road, Manchester

PERCY S. DE SAULLES.
Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES.
Micro Cover Glasses, Glass Cells and Cavity Slips, etc.
The Platts, Amblecote, Stourbridge.



OPTICAL BLOCKS
To illustrate all features of Optical Service. Write for Lists.
Chemists' Design Service,
12, Humberstone Gate, Leicester.

Microscopes & Accessories
PHOTOMICROGRAPHIC APPARATUS, APLANATIC MAGNIFIERS, Etc.
WRITE FOR LIST AND TERMS, Post free on application.
Estab. 1765

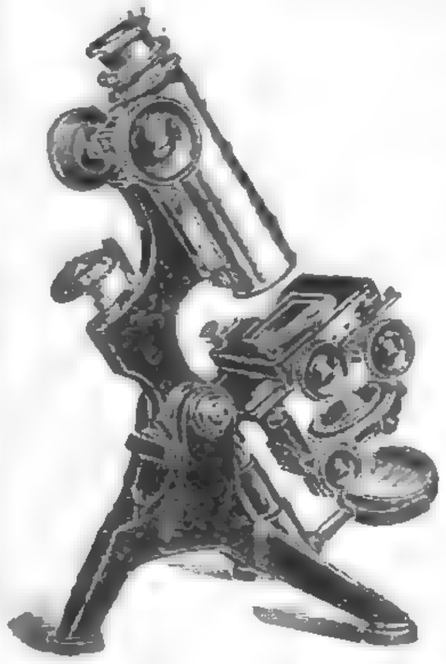
W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
C. H. DYMOND, M.I.Mech.E., F.I.C.P.A
W. P. THOMPSON & CO.,
12, Church Street, Liverpool.
Chartered Patent Agents.
H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG, M.T.I., F.I.C.P.A.

T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and AERONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
Established 1878 Telephone City 619

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

SELL WATSONS' BRITISH-MADE MICROSCOPES

NOW READY.



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,
313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1937.

Scientific Instrument Makers.

MICROSCOPES of all kinds manufactured at our own works.

REPAIRS to Prismatic and other Binoculars etc., promptly executed.

H. H. SHARLAND (H. KEMP),
9 & 10, THAVIES INN, HOLBORN CIRCUS, LONDON, E.C.
Tel.: Holborn 4846. Established 1850.

Every Description of Ophthalmic Supplies.
All Requirements of the up-to-date Sight Testing Optician.
Good Special Lines at keenly Competitive Prices.

BRITISH OPTICAL INSTITUTE, LTD.,
(College of Optics).

Complete Training for the Sight-Testing Optician.

In addition to the usual Daily Classes and Correspondence Courses, there will commence shortly a series of Special Evening Classes, for those desirous of preparing themselves for any of the Optical Examinations.

A further series of Weekly Evening Lectures, and Demonstrations, for candidates for the F.B.O.A. Examination, and for post-graduates, has also been arranged.

Vacation Classes.

From July to October a series of Vacation Classes will be held for those who wish to widen their knowledge—not necessarily with a view to sitting for any examination.

The whole work of the Institute is carried out under the supervision of the Principal, assisted by Mr. G. W. Colebrook, F.B.O.A., F.S.M.C., (Master's Prizeman).

For full particulars apply to:—The Principal, Dr. MAX COQUE, B.Sc., Fern Lodge, 20a, Grove Road, Brixton, S.W.9
Telephone: Brixton 677.

The Optician's Handbook.

Price 4s. 0d. Post Free.

An elementary text book required by every student of Optics.

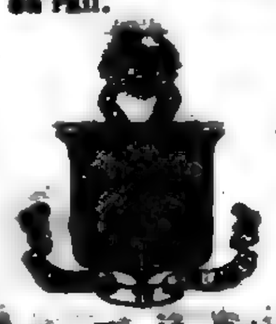
It is an introduction to "The Study of the Refraction of the Eye, its Anomalies and their Estimation and Correction by means of Glasses.

The Hatton Press, Ltd.,
125, Fleet Street, LONDON, E.C.4

Telephone JAMES B. SLY, Central 10296.
8 & 10, EDWARD ST., WARDOUR ST.
LONDON, W. 1

To S.M.C., B.O.A. & I.O.O. DIPLOMA HOLDERS

Oak frames and modelled gold Arms for the diplomas The Arms of the S.M.C., City of London, and devices of the I.O.O., B.O.A. and Ph. Society in water colours, and framed dark oak, with descriptive engraved plate affixed, 27/6 each. Packed and put on rail.



Printed & Embossed Optical Stationery.
Steel Dies for use of Diploma Holders.
Electros of Coat of Arms & Optical Devices.
Engraved Seals, Presentation Forms, Signs, etc.
Price List on application.

Electro No. 12 Price 5/6

Worshipful Company of Spectaclemakers.

Tuition for the Company's Examinations in Optics and Sight Testing at
THE SCHOOL OF OPTICS Ltd.

2, GUILFORD PLACE, LONDON, W.C. 1

Particulars on application.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

A.—**Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

NEGRETTI & ZAMBRA have opening for young assistant about to qualify, previous retail experience desirable. Write, stating experience and salary enclosing photo to 38, Holborn Viaduct, E.C.1. Communications confidential.

WATCHMAKER, improver, studying for S.M.C. exam. desires position with jeweller-optician. J. F. Hutchings, 42, High Street, Wincanton, Somerset.

POSITION required by one experienced in block and prescription work. Able to take charge of either. London or suburbs only. Box 5735, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT (D.B.O.A.), with considerable experience seeks position in the Midlands. Capable of taking charge. Box 5734, c/o "The Optician," 125, Fleet Street, E.C.4.

REQUIRED for India, thoroughly competent optician, qualified preferred. Apply, Lawrence & Mayo, Ltd., 19, New Oxford Street, London.

SIGHT-TESTING. Situation wanted, 30 years' experience, sole charge, can do repairs. B., 96, Hawthorne Street, N.F. Pool, Leicester.

RELIABLE Sight-tester, workshop experience, would like to travel for wholesale firm. What offers to Box 5732, c/o "The Optician," 125, Fleet Street, E.C.4.

COMPETENT refractionist seeks berth as an assistant for sight-testing department. Would consider part assistant and part workshop. Box 5733, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Man requires situation in London. 4 years' experience in workshop and sight-testing. Box 5741, c/o "The Optician," 125, Fleet Street, E.C.4.

SMART Assistant required, good refractionist with bench experience. Full particulars, references, etc., to Ryan, 65, Dublin Road, Belfast.

PROFESSIONAL Optical Organisation requires Secretary, capable organiser, knowledge of optical trade preferable, part time service to commence. State age, experience, salary required and full particulars to Box 5731, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED Junior for Northern sight-testing business, one acquainted with optical bench work preferred. State previous experience and salary required. Box 5730, c/o "The Optician," 125, Fleet Street, E.C.4.

OPTICAL and Mechanical instrument maker desires change, 10 years' experience in the manufactory. References. Scottish diploma for sight-testing. Box 5729, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACER, 24, seeks situation. Thoroughly accustomed to prescription work. T.D., 251, East India Dock Rd., E.14.

WANTED, young man, smart appearance, all-round worker, rimless fitting essential, good opportunities. Write stating age and salary required to C. Winston, 32, Kirkgate, Bradford.

EXPERIENCED Young lady required for prescription department. Box 5736, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG LADY, 20, requires situation as invoice or account typist. 3½ years' experience. W.W., 52, Fitzroy Road, Regent's Park, N.W.

JOBBER, good, able to do all classes work, mountings, repairs, etc., no surfacing. Permanent. North of England. Reply, full particulars, experience, wages. Box 5739, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST with S.M.C. or B.O.A. diploma wanted for first-class English firm in the East. Single, age 25/33, excellent opening for man of ability. Write, Box A139, Willings, Moorgate Arcade, E.C.2.

QUALIFIED refractionist, 30 years' experience in workshop, testroom and fitting, would accept berth as manager or under-manager. Box 5740, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED. Rimless driller and fitter, able to set and adjust to measurements as ordered. Box 5726, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED. Shell and gold worker for repairs and adjustments. Box 5727, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN, 21, studying for F.S.M.C. desires progressive position in retail optical trade. Box 5725, c/o "The Optician," 125, Fleet Street, E.C.4.

OPTICAL INSTRUMENTS. Test room assistant, conscientious worker, requires position any capacity, twelve years' general experience instrument work, control of labour. Box 5724, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG LADY, 22, five years' experience, seeks change. Thoroughly experienced in all prescription work, checking, measuring, adjusting knowledge of glazing, drilling and rimless fitting, slight knowledge of book-keeping and typing. Box 5723, c/o "The Optician," 125, Fleet Street, E.C.4.

METEOROLOGICAL and Scientific Instrument Maker, disengaged, requires position, maker or repairer, hand-turning, bench work, finishing, lacquering, own tools. 18 years' experience, any distance. F. Orford, 83, Ashmore Road, Paddington, W.9.

EMPLOYER can recommend a thoroughly reliable and qualified manager, for a similar position. Apply, Box 5719, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., D.B.O.A. (21), seeks re-engagement in London district. Box 5718, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS All-round gold worker requires situation, used to taking charge. Town, country or abroad. Apply, Box 5716, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED for India by Walter Bushnell, Ltd. A young single man. B.O.A. or S.M.C. State age, experience and fullest details re experience, character, etc., in strict confidence to Box 5717, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., 24, requires change, as sight-testing assistant or branch manager. London district preferred. Apply, Box 5715, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED Refractionist, 25, neutralising, transposing, cutting, drilling, rimless fitting, and all jobbing. 8 years' experience. Studying for S.M.C. F. Holt, 20, Lannoy Road, New Eltham, S.E.9.

LADY, Qualified, D.B.O.A., slight knowledge of retinoscopy, seeks engagement in London. Box 5714, c/o "The Optician, 125, Fleet Street, E.C.4.

D.B.O.A. passed part F.B.O.A., competent and careful tester, requires post in London or Midlands. Three years' experience. Age 29. Lidiard, 33, Chalk Hill, Watford.

YOUNG MAN recently qualified desires berth where opportunity for advancement and good experience can be gained. Must be in or near London or Glasgow. Box 5708, c/o "The Optician," 125, Fleet Street, E.C.4.

REQUIRED by energetic man, 28, position as manager or first assistant, 10 years' experience. Good salesman. Capable refractionist, disengaged. Box 5711, c/o "The Optician, 125, Fleet Street, E.C.4.

GOOD All-round repairer and frame maker, also rimless and glazing. W. Hiatt, 267, Essex Road, Islington, N.

Concluded on page 4.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

HAVE YOU

ASKED YOUR WHOLESALER

for particulars of

Bi-Liptic Reg^d.

BI-FOCAL

OPHTHALMIC LENSES?

They are manufactured by

UNITED KINGDOM OPTICAL CO., LTD.,

(Wholesale and Export Only.)

MILL HILL, LONDON, N.W.7

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE OPTICIAN
Regd. at G.P.O. as a Newspaper

AMERICAN OPTICAL COMPANY, LIMITED

WELLSWORTH POLISHED ALUMINIUM CASES.



The Wellsworth 24C Aluminium Case Cabinet is a most attractive and effective silent salesman. Keep it in a conspicuous place on your counter. It will sell cases for you.

The assortment contained it this cabinet consists of:

1—706 Fingerpiece size.
4—708 Regular Eyeglass size.
13—328 Riding Bow Spectacle size.
3—378 Large Riding Bow Spectacle size.
3—716 Large Fingerpiece size.

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

Offices: No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press [Ltd.], at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C.4. [Printed by The Century Press, Bedham.] Nov. 11, 1921.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT-MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1599 FRIDAY, NOV. 18, 1921.

WELLSWORTH OPHTHALMIC LENSES.



The predominance of Wellsworth Ophthalmic Lenses is due to their consistent high quality. Extraordinary care is taken in their manufacture, and every lens that bears the Wellsworth mark can be relied upon to be as true as expert workmen and science can make them.

Wellsworth Ophthalmic Lenses cannot be mistaken. Every package bears Wellsworth trade mark. That mark is your protection and assurance that you are getting lenses of precision.

WELLSWORTH

TRADE (A) MARK (Regd.)

OPTICAL PRODUCTS.

AMERICAN OPTICAL COMPANY, LIMITED,

39, Hatton Garden, LONDON, E.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

GEORGE CULVER LTD

Manufacturing Opticians,

JOBBING AND PRESCRIPTION WORK

ACCURACY,

NEATNESS,

PROMPTNESS

Large and full stocks of English made Lenses of all combinations. Orders can be executed promptly.

OPTICAL WORKS:
WHITE LION STREET,
PENTONVILLE,
LONDON, N. 1

TELEPHONE:
NORTH 369 and 871

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

W.H.T.

GOLD

LORGNETTES

ASTIGS

RX WORK

G. F.

SERVICE

W.H.T.

SUPPLIES

NICKEL

EFFICIENCY

FRAMES

MOUNTINGS

STEEL

WALTER H. THOMPSON

66 HATTON GARDEN, LONDON, E.C. 1.

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

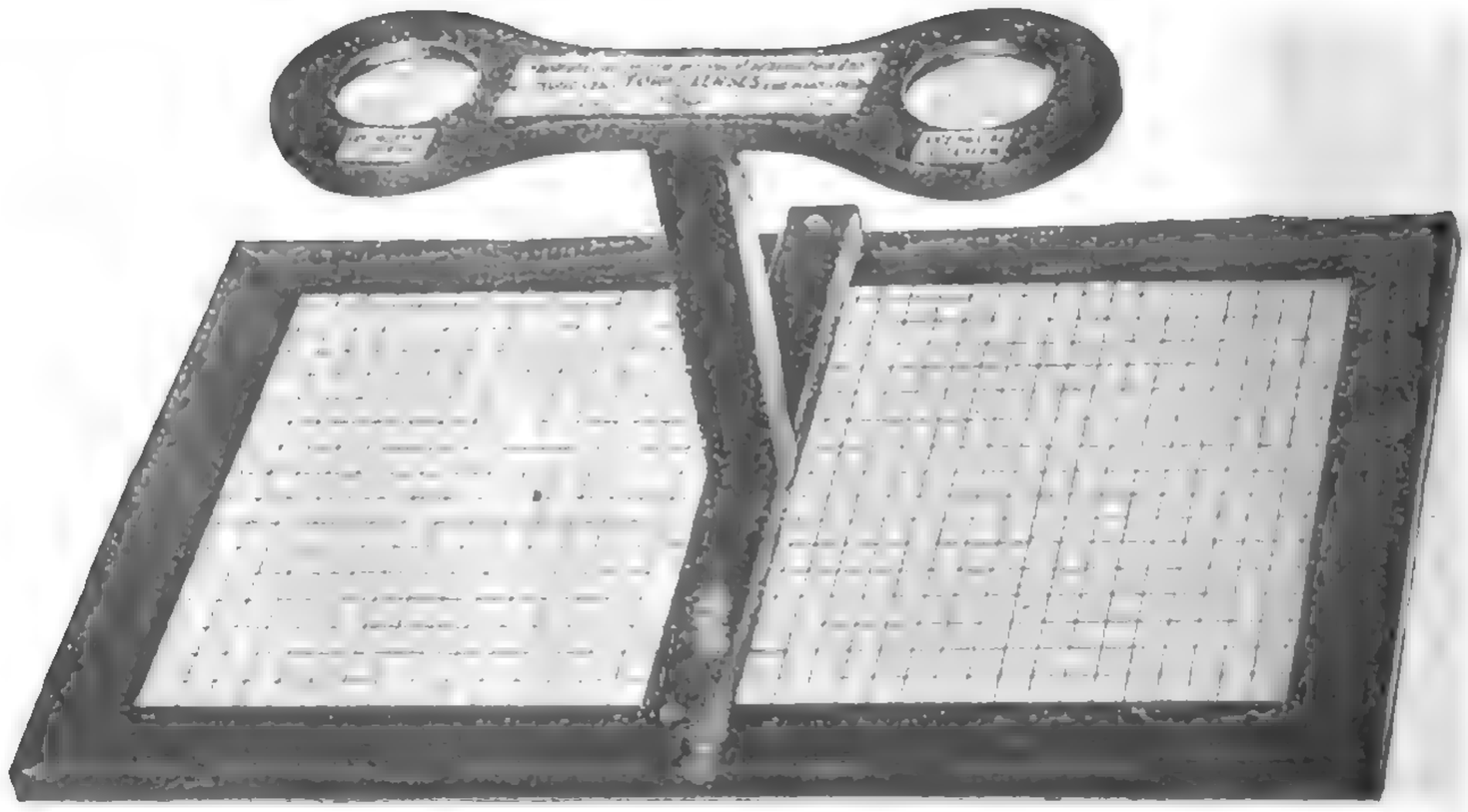
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

J.&R.F. LTD

SIMPLIFIED FORM OF

TORIC DEMONSTRATOR



Designed for the Counter or Waiting Room Table.

Demonstrates itself.

No time lost explaining elaborate apparatus to clients.

No lights or working parts to get out of order.

Inexpensive.

Particulars on Application.

J. & R. FLEMING LTD.,

Telephone :
HOLBORN {814 / 815
HOLBORN {2788 / 2789} Prescription Dept.

136-148 Clerkenwell Road,

LONDON, E.C. 1.

Telegrams :
"OTTICO." LONDON.

Branches with Prescription equipment :

WALTER BRAHAM & Co. Ltd.
6, Key Hill Drive,
BIRMINGHAM.
Phone : Central 2509
Telegrams : "Brahma."

37, WESTGATE STREET,
CARDIFF.
Phone : Cardiff 44
Telegrams : "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone : CENTRAL 1085.
Telegrams : "Ottico."

8, SHUDEHILL,
MANCHESTER.
Phone : Central 7711
Telegrams : "Ottico."

J.&R.F. LTD

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
The Rt. Hon. VISCOUNT HILL, L.C.C.

Upper Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Renter Warden
HARRY HYLTON-FOSTER. Esq., Past Master.

Director of Examinations
The Rt. Hon. SIR WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in May, 1922.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,599

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, NOV. 18, 1921.

The Opposition to Development of British Optical Industry.—On Thursday evening last week, some discussion on the operation of the Key Industries Act took place in the Upper House of Parliament. Viscount Haldane contended that "Professors were suffering great hardships at the present time." With regard to optical glass, he doubted whether industry was going to gain much by its production in this country. Lord Buckmaster said he did not think the extent to which the scientific student suffered under the burden of the new import duty was properly appreciated. It was difficult for a youth to save money to buy a microscope; and little short of intolerable that the heavy hand of protection should be laid on education, which deserved every sort of encouragement.

* * *

The occasion of these sage remarks was a proposition advanced by the Marquis of Crewe, that hardship is caused to teachers and students of science in universities and colleges by the application of the provisions of the Safeguarding of Industries Act to the apparatus and material necessary for education and re-

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

search in chemistry and physics. He said that the Safeguarding of Industries Act and the German Reparation Act had exercised a distinctly hampering effect upon both research and the teaching of many branches of science. A great many substances required by professors of chemistry and physics and engineers were now subject to high penalties before they could reach those who had to use them. He had received letters on the subject both from professors engaged in research and from advanced teachers. A distinguished professor of chemistry at one of the older universities wrote that there was no doubt that these Acts had had the effect of appreciably diminishing the amount of research work that could be done in the laboratory.

* * *

Purchasers For German Goods.—Some very considerable space has been occupied in our columns with the contention that British optical and scientific instrument dealers should refrain from selling goods of German manufacture, whenever the British article, which is its substitute (usually a better substitute) is to be had with ordinary facility, and of competitive quality, at anything like a reasonable price. The contention is patriotic, and economically sound, and in view of the most serious dangers to which it seems possible these Islands may be exposed again, it is certainly wise; indeed, the contrary view seems worse than foolish in its childish naiveté. In the Government's reply to criticism, the position taken up by the Minister of Transport (Viscount Peel) was that there would be no inducement to British manufacturers of scientific products to advance their work, unless assured that their market would not be destroyed by an influx of foreign goods. It was not practicable to exempt particular scientific and educational institutions from the light burden of the import duty. The cost of the things protected under the Key Industries Act was quite small by comparison with the other expenses of running and working these laboratories. If in four or five years' time from now the British scientific instrument manufacturers had made good their position, there would be a very much wider field provided for scientific workers. And if scientific men, would help manufacturers in this direction, the development would be much expedited. Lord Peel undertook, however, to put the whole subject before the Minister of Education.

* * *

What preference the Minister of Education may have in these matters we are unable to say at the moment. Deplorably enough, the views of all party politicians are coloured by their party principles, or perhaps rather party war cries, of Free Trade and Protection. Here it is not really a question of the large issue of Free Trade at all, but merely a narrow measure of self-preservation. If the optical and scientific instruments even more essential in war than in peace time, are to be imported, it would be just as reasonable to let to German constructors a contract for the building and maintenance of the British Navy. As for the scientists, their fullest support in the protection as in the improvement of British optical and scientific instrument making, might well have been looked for. But here again, we fear in too many instances, human nature enters a caveat. The professors are mostly engaged in teaching; and that part of the national resources which is applied to technical education and research, is divided between expenditure on salaries and on materials. In too many instances, as recent newspaper correspondence suggests, the note of self-interest attains a dominance which is to be regretted.

The Optical Society.

In addition to its ordinary programme, the Optical Society has arranged a series of special meetings to be devoted to subjects dealing with the evolution and development of various types of optical instruments. The Science Museum, Kensington, possesses a most interesting, and in many respects unique collection of such instruments, with the characteristics of which instrument makers and users might well be more familiar. By arrangement with the Museum authorities these instruments will be available at the meetings for purposes of illustration and demonstration. The first meeting of the series will be held at the Imperial College of Science and Technology on Thursday, the 24th inst., at 7.30 p.m., when Professor F. J. Cheshire, C.B.E., will deal with "Polarising Apparatus." Other subjects to be discussed at future meetings, include "Microscopes" (Prof. A. Pollard); "Telescopes" (Mr. D. Baxendall); "Astronomical and Surveying Instruments" (Mr. L. C. Martin).

Messrs. Eley Bros., of 10a, Acton Street, King's Cross Road, W.C., advertised (p. 4 of Supplement, No. 1597), disclaiming any intention of increasing their prices on their plus rough toric cylinders. We regret that an error was made by our printer in the name of the firm, which is as above.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

The William Ettles Memorial Lecture*

ON THE COMPARATIVE VALUE OF VARIOUS SKIAMETRIC METHODS AND PRACTICES.

Delivered by CHARLES SHEARD, A.B., A.M., Ph.D., Research Division of the American Optical Company, before The Institute of Ophthalmic Opticians.

As a result of experience, the writer generally obtains the static skiametric findings first, knowing that thereby he has found a correction, to the first order of approximation to say the least, that will place the eyes in as nearly a normal condition statically as possible. He then leaves in temporarily the spherical elements determined upon, in addition to the +1 D.S. used for the working distance skiascopically, and then has the patient fix a set of small letters on the mirror held at the patient's usual reading distance. This affords a rapid method of finding neutrality of shadows at this distance because, in the majority of cases, it is found that neutral shadows will be obtained almost immediately; if not, increase or decrease of lens quantities can be quickly made to effect neutral conditions. Cylindrical correcting lenses are removed in the dynamic determinations for reasons to be stated in succeeding paragraphs.

In myopia we may proceed in the same manner, and quite frequently do, but as often we start with no lens quantities before the eyes, using fixation and observation at the same distance, and add concave (minus) lenses until neutral shadows are obtained. Since the majority of refractive cases are those involving hyperopia, and since the greater portion of such cases evidence about the same amount of error in each eye, and develop, under test, equal accommodative ranges and amplitudes, and, furthermore, since the vertical imbalances *per se* are generally not of sufficient amount to interfere with the function of binocular single vision, it follows that dynamic skiametry is a valuable tool in the hands of those practitioners who will take the time to think upon these matters, and put them intelligently into practice.

Some Advantages of Dynamic Skiametry.

Small Pupils.—Large pupils may give inaccuracies in static skiametric work unless the refraction in the line of sight is carefully adhered to and observed. Smaller pupils, are therefore, preferable since there is a riddance of irregular refraction and spherical aberration in the peripheral zones. Hence, with accommodation and convergence at close points, together with the added stimulus of retinal illumination, the dynamic skiametric examinations quite frequently afford definiteness as to the principal refractive errors, eliminate the peripheral refraction and disclose the refraction in the line of vision.

Refraction in Line of Sight.

Refraction in the Line of Vision.—In our discussion of static skiametry reference was made to the fact that scissors movements and false conclusions as to astigmatic conditions might easily arise because of the fact that the eye under examination is not refracted in the direct line of sight. Various devices for obviating this trouble were pointed out. Dynamic skiametry permits of macular refraction without the use of any auxiliary device. We desire again to point out that errors may arise in skiametric work when the examination is made at a bad angle between observing and observed eyes. Dynamic skiametry, with its refraction along the visual axis, or static skiametry with the use of the macular reflectoscope, enables one to avoid these defects and to be positive of their physiological existence when they do occur.

Astigmatic Conditions.—Irrespective of our opinions as to the correctness or incorrectness of the spherical elements determined by dynamic skiametry, it is to be admitted that this method affords an excellent and rather accurate method of determining the amount of astigmatism. Where small amounts of astigmatism are uncertain by static methods it is generally true that they are discoverable by dynamic skiametry. And surely quarter diopters of astigmatism are worthy of attention and ought to be corrected as a general procedure if actually present, and omitted if not truly present. When the amounts and the axes of the astigmia do not agree with the static or subjective findings there are then presented those differences in ocular data

*Concluded from page 186.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

which enable the practitioner to ultimately find the real errors.

Astigmatism.

We are all aware of the rather pronounced differences met with in the data obtained subjectively, skiametrically and ophthalmometrically, upon the condition of astigmatism of an eye. Many physical and physiological reasons can be given to show why the ophthalmometric measurements, which give data upon the cornea only, should not indicate conditions of astigmatism in agreement with subjective and retinoscopic findings. And subjective and skiascopic findings may differ for various reasons (*vide* Sheard: 'Physiological Optics.'). The variations of amounts of astigmia can be accounted for more easily than variations in the apparent positions of the principal axes. Cases arise in which static skiascopic and subjective tests, conducted at twenty or more feet, disclose the axis of astigmatism at 90°, for example, when the ophthalmometer shows axes at slightly oblique positions, such as 80° or 100°. Furthermore, it often occurs that ophthalmometrically determined axes agree better with dynamic skiametric findings than with the monocular determinations obtained with either static skiascopic or subjective methods.

E. S. McClelland, M.D., in a recent article, calls attention to the fact, as he believes it to be, that "The dynamic method of retinoscopy is the only satisfactory one for the correction of hyperopic astigmatism in children, because it eliminates the confusing and unimportant shadows of exaggerated astigmatism and other peripheral defects exposed by a fully dilated pupil, and also because it corrects an accommodated eye and not a relaxed one. Two things are of utmost importance in the correction of variable or hyperopic astigmatism in children, *viz* a concentrated light of not less than eighty candle-power properly arranged and the eye to be correctly focused for a meter's distance."

Presbyopia.—Cross says of the use of dynamic skiametry in presbyopia: "Presbyopia is the one, so-called, 'easy' ocular condition that is often the most difficult of satisfactory correction, for the reason that occupation, illumination, habit, pupillary distance and innervation, or bodily vigour, are all factors to be reckoned with. Then, if combined with this the ignorance and stupidity of many patients in answering questions is taken into consideration, it is easy to see why changes in reading glasses are so frequent. Up to the time of the development of the dynamic method of practising skiametry there was no known method of estimating presbyopia in an objective manner. All static methods, whether with or without cycloplegics, are solely for determining the refractive condition of an eye when its muscles are in a state of complete relaxation; therefore, the static method gives no definite aid in presbyopia whatsoever. Dynamic skiametry supplies the refractionist with a method that often proves of the very greatest aid in mastering a troublesome case, as it enables the eyes to be studied at all points, near as well as distant, this study being directed towards steadiness of convergence and accommodation, both of which can be detected through the use of a skiascope and lenses."

The practitioner is also given a method of objectively determining whether or not the accommodative need is the same in each of the two eyes tested. There is no reason for believing that there is an equality of accommodative amplitude of both eyes unless various tests show that such is the case. If the amplitudes of accommodation are equal, then the refractive assistance demanded as the fixation point is advanced closer and closer to the eyes should increase identically the same for both eyes; if the amplitudes are unequal, then the skiametric findings at closer points should show a greater lenticular assistance demanded by the weaker eye. The data afforded by such tests give us information of much value in the fitting of a pair of presbyopic eyes. Furthermore, it is always necessary to allow a portion —say one-half—of the accommodation to be kept in reserve, and the other portion to be actually or actively used in close work. But the question is: How much in reserve and how much at work? Evidently each pair of eyes is a law unto itself.

The Phorias.

Other questions which must be answered before a satisfactory reply is forthcoming to this query are: Is there exophoria, or esophoria, or orthophoria (using the notation commonly employed in such connection) at the reading point? Are the fusion reserves adequate? As a result of additional investigations on the convergence relations there may come a reasonably scientific answer as to the amount of presbyopic corrections. But the test by dynamic skiametry quickly and accurately indicates the lenticular assistance needed in presbyopia.

Subnormal Accommodation.—Dynamic skiametry is one of the most useful of all methods for determining conditions of subnormal ac-

Digitized by Google Original from THE OHIO STATE UNIVERSITY



The Easy Way to Persistent Publicity.

We can and will help you to tell all your own public that they must consult you about Chance's "Crookes" Glass.

For newspaper advertising, we have three special four-inch double column, and three special four-inch single column advertisements. They are illustrated, complete with telling "copy," wanting only your name and address and any extra message you want to insert. We will let you have the blocks—all or any of them—free if you will write.

For cinema, music-hall and theatre advertising, we will supply you free with one or more copies of a lantern slide which is very distinctive and telling in design and message. We will insert your name and address on this.

To use these two separate types of appeal is certain to bring you a wider clientele. Will you write us?

CHANCE BROS. & Co., Ltd.,

Glass Works,

Smethwick, Birmingham.



Chance's "CROOKES Glass"

The late Sir Wm. Crookes, O.M., F.R.S., to whose researches was largely due the evolution of Chance's "Crookes" Glass.

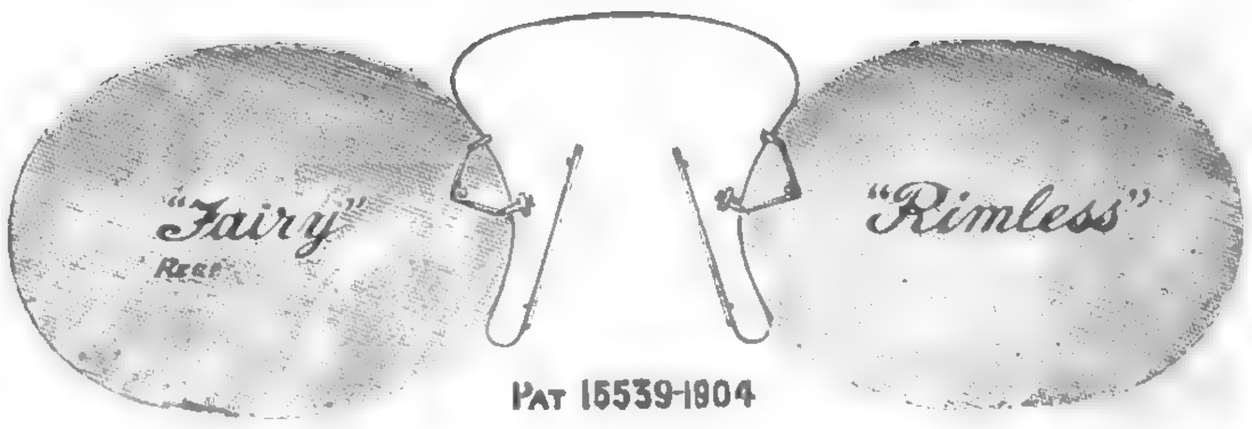
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Phone:—City 3225 (3 lines) *Telegrams:—Bulford, BARB. London.*

PATENT "FAIRY" REGD MOUNTINGS.

Have taken a distinctive place in the World of Eyeglasses
SOLELY UPON MERITS.



By the Patent Method of Attachment, they, as it were, make the two Lenses and Pitting One Piece, giving that Rigidity upon the face which makes them a pleasure to wear.

Royalty wear them; people of note wear them, and it should interest you to sell them as we make them in Gold only.



There are Points of Refinement in the design rendered possible only by the Patent Method of Attachment to the Lenses.

Made by the firm whose Reputation for Prescription Work is:—*"Second to None."*

NEWBOLD & BULFORD, ***Prescription House,***
GOSWELL ROAD, LONDON
E.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

commodation. Such subnormal accommodation may be variously classed as (1) insufficiency of accommodation; (2) difficult or ill-sustained accommodation; (3) inertia of accommodation; (4) inequality of accommodation; and (5) excessive accommodation.

Monocular and Binocular Amplitudes of Accommodation.

The principles and *modus operandi* of dynamic skiametry may be employed to test the monocular and binocular amplitudes of accommodation. Some few years ago the writer devised this method and believes it to be original with him; at least, he has never found it recorded nor seen it practised prior to his own conception of the procedure. It is extremely simple of operation and in technique, and yet forms an *objective* method, as opposed to a subjective procedure. In brief, the method is as follows:

The person under test is given a vertical line of type printed in about twelve-point caps, upon a card about one-quarter inch wide, and fastened to some simple and convenient holder of about the same width. Or a single line ruled on a card, or a pencil will serve quite satisfactorily as a fixation object, but there is not the incentive to full accommodation as when reading is demanded. The full monocular distance finding, affording as nearly V=20/20 as possible, is inserted before the eye to be tested. The patient is then given the test-object—which he holds initially at about thirteen inches—and is told to read the letters or make the attempt to do so. Or the operator may hold the test-object in one hand and approach it towards the patient. In general we have the patient hold the card slightly to the nasel side during the examination of either eye while we proceed to examine skiametrically from the temporal side, and as close to the visual line as possible.

In ideal conditions the retina and the object viewed should be exactly conjugate points. This will obtain if the exact or requisite number of diopters of accommodation and fractions thereof are supplied. Hence, skiascopically, if this condition were to hold then the skiametric shadow would be neutral—observation and fixation points being the same—as the mirror is approached toward the eye. But if the object were to be slowly advanced towards the eye, the observation point, *i.e.*, the operator remaining fixed in position, an against motion would arise, while if the test object were to be moved back of the observer's mirror a with motion would occur. By then moving or having the patient move the test-object nearer the eye the actual near-point will be found as soon as the retinoscopic mirror has to be operated in a plane behind the fixation point in order to obtain a neutral shadow. These are ideal conditions in that we are assuming the presence of a true or artificially produced emmetropia, and a perfectly innervated and functioning ciliary and lenticular action and that there is no lag of accommodation behind the convergence. In short, we are here writing of ideal and physically perfect conditions.

In general, we find that when the patient, wearing the full distance correction, reads monocularly the letters, there is a with or hyperopic motion—using the plane mirror—indicating that the point conjugate to the retina in an eye optically statically perfect is not at the position of the object viewed, but at a point somewhat behind that point, *i.e.*, farther from the eye. Three valuable tests may be made. First: with monocular fixation and observation skiametrically at any point desired, the operator can find that convex lens power which must be added in order that the monocular accommodative demands, in the interest of conjugacy of retina and object viewed, may be met. This would be indicated by the additional lens power needed to give a neutral retinoscopic reflex.

The Interpretation.

Suppose that +1 D.S. is thus demanded when both fixation and observation points are at thirteen inches: our interpretation would be that objectively an assistance to the accommodation over and above the assistance (or burden and tax in cases of over-corrected myopia) afforded by the static findings given the eye is required to relieve the accommodation of an extra burden. Notice that we specify minimum amount of additional lens power to produce neutralisation skiascopically; more assistance might be and generally would be accepted under the method of procedure we have disclosed.

Second: observation may be kept constant at any distance specified and the test-object drawn closer to the eye until a neutral shadow is obtained. For example, in a certain case the distance from the test-object to the observed eye is ten inches and the distance between the skiametric mirror and the observed eye is thirteen inches, at which point a neutral shadow condition holds; we should conclude that the accommodation actually available at ten inches is sufficient only for optical conjugacy at thirteen inches, hence indicating the need of a diopter of lenticular

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

assistance. We must, however, bear in mind the probable physiological lag of accommodation which amounts, in the average case, to about one-half diopter.

Third: by approaching the object closer and closer to the eye a point will finally be found such that no nearer approach of the test-object to the eye will change the neutral condition of reflex as skiascopically observed at the closest point to the eye at which a neutral shadow is obtained.

In testing, therefore, for the near-point objectively we proceed as follows: The patient draws the test-object as near to the eye as will still permit of its reading. To the observer at thirteen inches the skiascopic reflex will show an against or myopic condition indicating that he is outside of the optical ocular far-point dynamically considered. The operator then moves forward until he obtains the neutral shadow position. The test-object is then carried still closer to the eye (blurred image as reported by the persons under test makes no difference), and the nearest point of neutral shadow found and measured. This gives the apparent near-point under whatever ocular conditions the test is made (ordinarily when wearing the distance correction) and from it the range and amplitude of accommodation are readily determined. The reader will find some twenty pages of the author's "Dynamic Skiametry" devoted to this topic.

Illustrative Cases.

Case A. *Subnormal Accommodation.*—Mr. S., aged 22. Static skiametric findings O.U. +0.62 cyl. ax. 90. Subjectively, same findings, V=20/20. Under homatropine the findings were the same. Dynamic skiametry gave O.U. +1.50 D.S., +0.62 cyl. ax. 90, with fixation and observation at thirteen inches, to produce neutral shadows. This finding evidences an accommodative need of about one diopter. Other tests on the amplitude of accommodation showed about 5 D. as a maximum. Patient complained of inability to engage in close work for any length of time. Ophthalmoscopic examination showed choroiditis in one eye and incipient conditions of choroi-retinitis in the other. Wassermann test positive; hence the probable set of the abnormal accommodation was disclosed.

Case B. *Simulated Myopia.*—Young lady, age 23 years. Complained of frontal headaches, eye-burn, photophobia and the usual train of accommodative strain symptoms. Static skiascopic tests showed O.U. −0.50 D.S. Dynamic skiametry with observation and fixation at fifteen inches, gave O.U. +0.50 D.S. for neutralisation and +1.25 D.S. for reversal of shadow. Subjective binocular tests showed that O.U. −0.25 D.S. gave normal acuity, and that O.U. +0.50 D.S. reduced it to not better than 7/10. The tonicity tests gave 2△ of esophoria, and the accommodative convergence test evidenced 7△ of esophoria. These latter investigations were made without any lenses before the patient's eyes. We gave O.U. +0.50 D.S. which relieved the symptoms and after a few weeks' time gave practically normal acuity as well as comfort.

Case C. *Hyperopia with High Esophoria.*—A young man, a chemist, who had suffered great ocular discomfort for years, presented himself and gave an interesting history of all kinds of ocular treatment. The observations on this case covered some two or three years, hence must be abbreviated in the report given here. The initial examination showed, using static skiascopy, O.U. +1.00 D.S. +0.50 cyl. ax. 90. Dynamic skiametry showed that +2.50 D.S., +0.50 cyl. ax. 90 gave neutral shadows at thirteen inches. Without correction of any kind, the tonicity rests evidenced 10△ of esophoria, and the accommodative convergence measurements some 13△ of esophoria. Subjectively, O.U. +1.25 D.S., +0.50 cyl. ax. 90 in the first examination did not give better than 8/10. We gave this young man O.U. +1.37 D.S., +0.50 ax 90 for constant wear. He became accustomed in a short time to the blurring caused by these glasses. We prescribed for him a year and a half later the full dynamic skiametric findings. These he wears with comfort and efficiency in his work, but with an acuity not quite equal to 8/10. The criterion of normal visual acuity is a poor one in many cases, especially in conditions which are similar to the one we have just described.

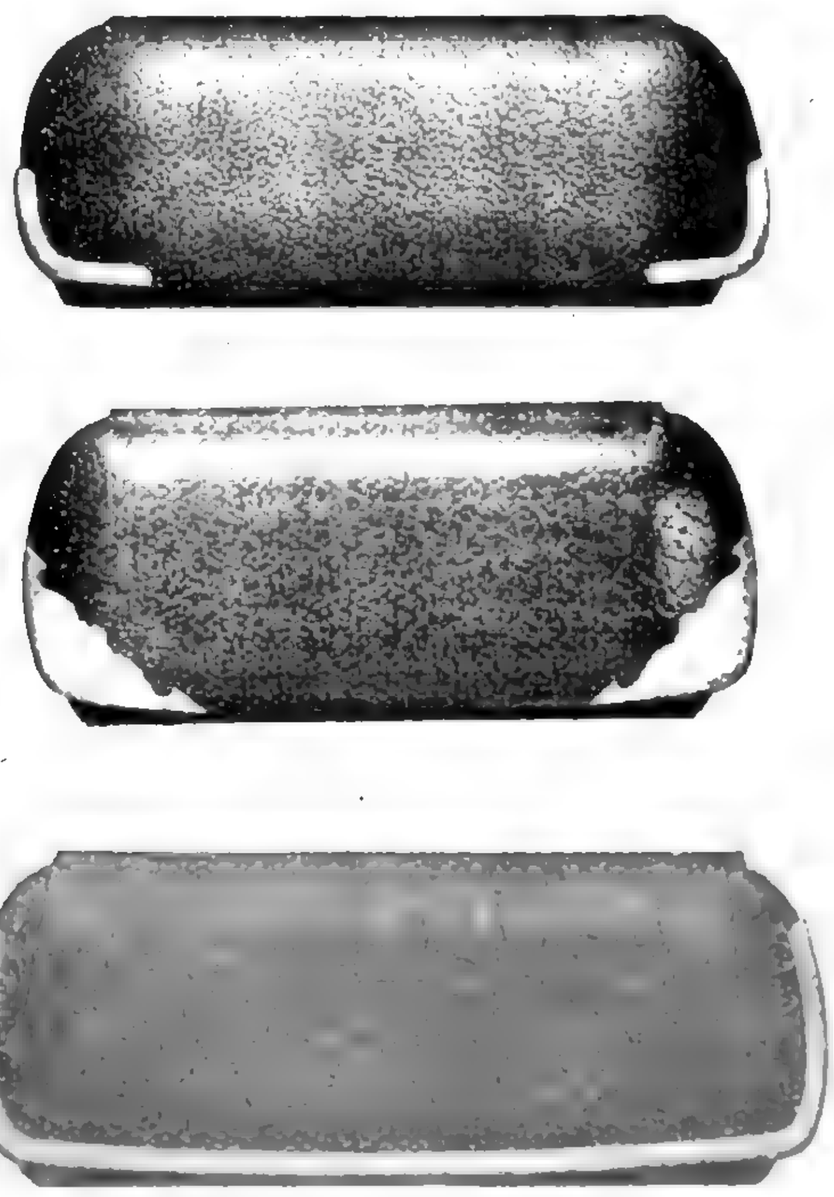
Summary.

In closing this lecture we are giving a summary of some points relative to dynamic skiametry and its science in ocular refraction.

(1) Data of value accrue to the practitioner through investigations by dynamic skiametry in which tests upon the co-ordination of convergence and accommodation, or simply upon the accommodative needs, to the enhancement of ocular comfort and economy while engaged in reading and other close work, are made possible objectively. The fact that static and dynamic results are not in agreement furnishes a basis for the determination of the proper assistance to be furnished in the interests of the dynamic functionings of the accommodative mechanism, and furthermore, enables the

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Silver Mounted Cases.



These Silver Mounted Cases are beautifully finished in high-class leathers of various grains and dainty shades.

Particulars and samples direct from the manufacturers.

WILLMOTTS LIMITED,

EVESHAM, Willmotts Ltd **WORCESTERSHIRE,**

ENGLAND.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Give Your Personal Guarantee of Accuracy and Quality.

TO be able to assure each of your Clients of the workmanship, quality, finish and accuracy of the eyeglasses you supply is a great asset to your business.

You can unhesitatingly do this when you entrust the execution of your Rx orders to the L.O.C. organisation.

We consider ourselves quite as responsible for satisfying your Clients as if we were actually a part of your own establishment.

The reason we, in return, are able to guarantee you satisfaction is because every order you place in our care has the personal direct supervision of our principals, while the actual work is handled by highly-trained employees, controlled by technical experts in each branch of the work.

When you bear in mind that the L.O.C. Service offers these advantages at a cost comparable with that of work much inferior in character, you should ask yourself whether you are justified in ignoring our claims.

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rueide la Pepiniere, Paris. France.

Also at—2, Str-Barsei, Bucharest, Roumania.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

operator to inhibit excessive innervation, relieve weaknesses, or to economically draw upon functions which are in strength to the relief of those which are in weakness through the medium of the lenses which are prescribed.

(2) Dynamic skiametry *per se* is to be considered as an objective method of determining the negative relative accommodation, when observation and fixation are made at the same point and the lens quantities changed until reversal occurs.

Inference from Dynamic Findings.

(3) Dynamic skiametric findings taken at the reading-point indicate increased convex lens corrections as compare with the static skiascopic and subjective acuity findings when presbyopia, sub-normal accommodation or latent hyperopia conditions exist. Such findings indicate the need of lenticular assistance in near work; also, when fusion dissociation tests at thirteen inches (or other point near the eyes) show the existence of an over-convergence associated with the accommodation in cases where little if any refractive errors or muscular imbalances exist at distance.

(4) The dynamic skiametric findings in myopia generally indicate lesser concave lens findings at the reading-point than at twenty feet, because the deficiency in convergence, or exophoria, usually associated with myopia, is supplied by the fusional convergence, since the decreased accommodative demands in such cases elicit a corresponding decrease in the convergence associated with accommodation. It is probable, therefore, in cases of myopia in which fixation and observation points are outside of the patient's far-point, that dynamic skiametry will indicate findings in fair agreement with those which would statically result if the patient's far-point were to be left at the point at which observations are made. If such results accrue, it is evidence that full distance corrections should not be ordinarily prescribed for general use, and especially for close work, since a too radical readjustment of the relations between accommodative convergence, fusional convergence and the accommodative act itself is not desirable.

The history of the case, the symptoms of which complaint is made, the previous ocular corrections worn, or the absence of any previous refractive attention, must aid the practitioner in the judgment which he forms, and prescriptions which he finally gives.

In cases where the reserve fusional convergence is extremely weak or heavily overtaxed, it may happen that this deficiency in convergence will be supplied by additional accommodative convergence through an over stimulation of accommodation, thereby indicating to the dynamic skiametrist as great, or greater, concave lens corrections at near as at distance. The demand for binocular single vision is met by increased accommodative convergence through the medium of accommodation. Or, again, cases may arise in which greater degrees of myopia are indicated at the reading point as compared with the data furnished by the static findings. In such cases there is invariably a pronounced functional exophoria or, again, a condition of affairs in which this marked divergence is coupled with an accommodative mechanism in which less than one diopter of innervation accomplishes the act of one diopter of accommodative change.

(5) The dynamic skiametric findings, in which hyperopic conditions (*i.e.*, accommodative demands) are apparently found existent at near points, while static methods evidence low-valued myopic conditions at distance, demand careful investigation. Such findings are commonly found to exist in connections with spasms of accommodation and in cases in which there is an over-stimulation of the interni by virtue of the convergence associated with the innervation delivered in the interests of accommodation, indicating esophoric conditions at the reading point.

(6) All skiametric and subjective findings should and must be supplemented by tests upon the amplitude of accommodation, the reserve convergence and investigations upon the convergence associated with the accommodation, while fusional convergence is passive, at the normal reading and near-work point. Such tests enable the practitioner to correctly analyse his case and to know why and in the interests of what function or functions his final prescription is to be given.

Discussion.

At the close of the lecture, Mr. W. H. Nichols (Chairman) invited questions; but as none were asked, a vote of thanks to Dr. Sheard was proposed by Mr. Lionel Laurance, who said: Mr. Chairman, Ladies and Gentlemen. I have pleasure in proposing a vote of thanks to Dr. Sheard for his very interesting lecture to-night. Dr. Sheard's reputation is a world-wide one. Firstly, I believe he was Professor of the Optical Department of the University of Ohio. Now he is the technical advisor of the American Optical Company; and as editor of the 'Journal of Physiological Optics' he is known throughout the world as

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

a scientist who has done an enormous amount of good for visual and physiological optics.

I can add this—that I have the pleasure of a personal acquaintance with Dr. Sheard, and I can assure you that he is just as great a man, and as good a fellow, as he is a scientist of renown. We have to thank Dr. Sheard, as members of this Institute, for having crossed the Atlantic to give us this beautiful lecture. As members of the ophthalmic craft we have to thank him further for having come to give us a little of his great knowledge on the subject that he has been dealiing with. This subject of retinoscopy is one that is of real interest to all of us. We all try to practise it, and we all know of the difficulties that we meet with in its practice. Whether we agree, or not, with all the deductions that Dr. Sheard makes, or with all his observations that he has attained in a test, I am sure that his lecture will prove a most valuable contribution to our knowledge of the subject, and will give us light and thought, and an opportunity of considering the subject from different aspects; and, no doubt, it will increase, or I hope will increase our knowledge of the subject. Ladies and gentleman, I propose that we give Dr. Sheard, in the usual manner, a most hearty vote of thanks.

Some Reminiscences.

Mr. Spiegelhalter: As one of the oldest members of the Institute, and as representing the Provinces, I have much pleasure in seconding the resolution that has been proposed by Mr. Laurance. In attending this meeting to-night I have been made to think. For the last time I had the privilege of being in this noble hall was on an occasion when I occupied the chair, and Dr. Ettles was the lecturer. It is a peculiarly happy thing that we have to-night, as Mr. Laurance has reminded us, a man of world-wide repute, and one of the greatest of our scientists in optics to give us a lecture in memory of our great friend, Dr. Ettles. Another thing has struck me as peculiarly appropriate. As provincials we, perhaps, feel it more than you do in London. We revere these ancient halls; they have had the greatest scientific discoveries illustrated in them; and it is therefore appropriate that we should have with us to-night one of our latest modern scientific developers of the science of optics. I believe Michael Faraday first showed here his greatest experiment, which resulted in demonstrating electrical induction. It is very fit that we, as opticians, should hear of the latest developments in the science of optics; and the practised, and charming manner in which Dr. Sheard has delivered his lecture, makes us envy those students who have had the privilege of learning from him. I have travelled hundreds of miles to hear this lecture, and I have been well rewarded for every mile that I have travelled, and I am sure you will join in according the very hearty vote of thanks to Dr. Sheard, which Mr. Laurance has so ably proposed.

Mr. W. H. Nichols (Chairman): Before I put that vote to you, I should like to say how very sincerely I would like to support it. The very close attention with which you have listened to Dr. Sheard shows unmistakably how much you have appreciated his lecture. I am sure, also, you have valued and appreciated the kind references that have been made to the loss the Institute sustained in the death of Dr. Ettles, whose memory we are here to-night to commemorate. I ask you to show how very cordially you have appreciated the lecture which has been given by Dr. Sheard.

Dr. Sheard's Response.

In responding to the vote of thanks Dr. Sheard said: I take these words of appreciation, and this clapping of hands as a token of your pleasure at having me with you. I can assure that it is a great honour and a great privilege to me to stand within these walls. I have been told, and you have been told, to-night, of the sanctity connected with this hall, and of the wonderful men who have stood on this platform and addressed audiences here. I must be by nature more or less a hero worshipper. It will afford me great inspiration as I go back: it will serve as a sort of stimulus to me; and I hope that the mere fact of my having stood upon this platform may be the means of the production of something which is worth while in the science which is so close to my heart, and to your hearts also. I cannot go from you without telling you, as an audience, how greatly I appreciate having been made an Honorary Fellow of this Institute. You do not know what that means to me. If you were to give me lots of fine raiment, and much pure gold, it would not give me anything like the satisfaction that this honour carries with it, because that has come from your hearts, and not from your pockets, and that is the source from which I would have it come. I give you from my heart these words—I would not have missed all this for anything in the world.

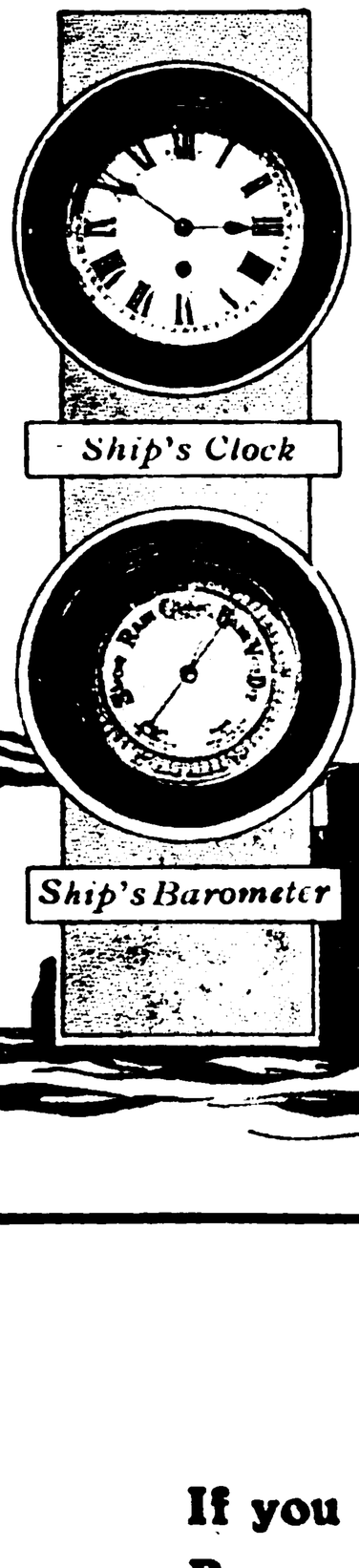
Matter intended for the current weeks' "Optician" must reach this office on the Tuesday morning preceding publication.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

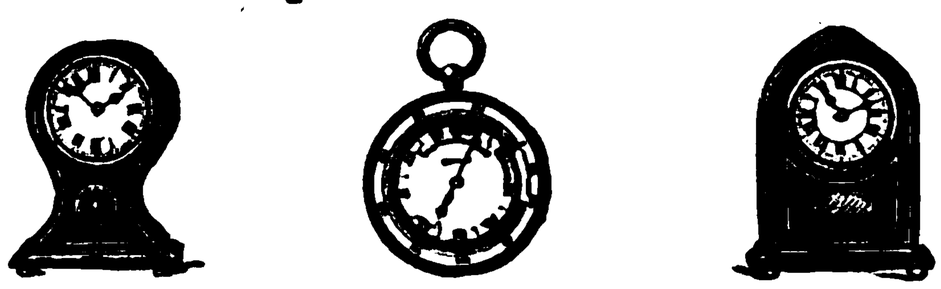
T. A. R. & Co.

"THE ALL BRITISH HOUSE."

Over 2,000 Designs in Aneroid Barometers.



Time and Tide
And Ship's Instruments



T. A. REYNOLDS & CO
40-1-2 PERCIVAL STREET,
LONDON E.C.1



Steam-pipe Thermometer *Hydrometer*

Telegrams—
"THERBAROME. LONDON."

Telephone—
339 CITY.

Showrooms and Offices at above address.

If you are a Retailer and need ORIGINAL LINES in Barometers, Clocks and Thermometers, write us, and although we will not supply you direct, we will put you in touch with the Nearest Wholesale House.

WHOLESALE AND SHIPPING TRADE ONLY.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

STRENGTH

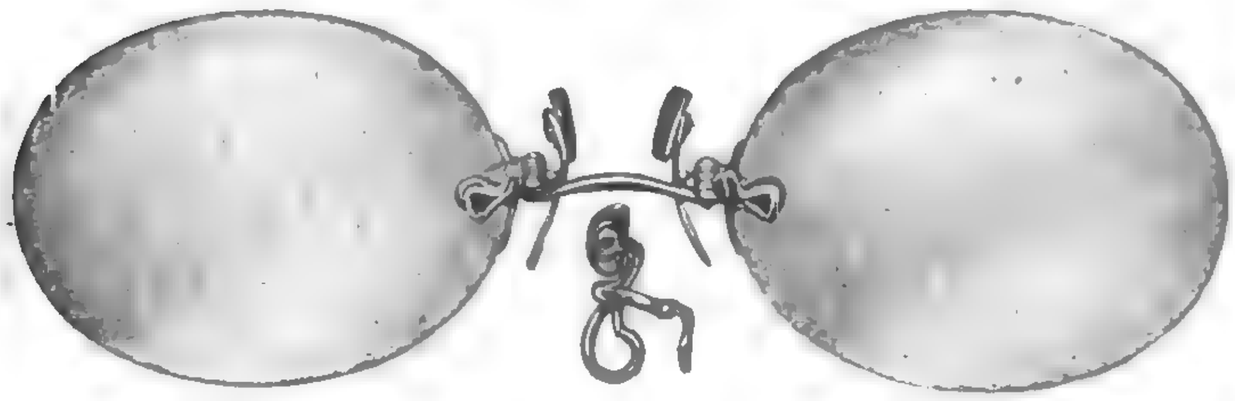
Strength is an important element of Realfit Finger Piece Mountings and Frames. That's one reason for their popularity. They give consistent service year after year.

Realfit Finger Piece Mountings wear longer and give greater satisfaction. The extraordinary care exercised in their manufacture, the materials which are used throughout, and the five inspections which every Realfit undergoes before being pronounced ready for shipment, all tend to assure STRENGTH, accuracy and neatness of appearance that is far from ordinary.

REALFIT OPTICAL PRODUCTS NJ



REALFIT *Finger Piece.*



Made in a complete assortment of Guards. Ask your Wholesaler.

NEW JERSEY OPTICAL Co.,
Newark, N.J., U.S.A.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Geometrical Ophthalmic Optics.—VIII.

By WILLIAM SWAINE, B.Sc.

Limitation of Paraxial Rays. Entrance and Exit Pupils.

In the table of Paraxial Schematic Eyes (Article VII.) particulars were given relating to the entrance and exit pupils which we are about to discuss. As is well-known the main function of the pupil of the eye is to control the amount of light entering the eye. It is situated at the anterior crystalline surface, is approximately circular and may vary in diameter between two and eight millimeters. In general, any optical system will possess a limiting *diaphragm* or *stop*. In whatever position this physical stop may be placed, real or virtual images of it will be formed (*a*) by the portion of the system lying in front of it, (*b*) by the portion behind it. The forward image is called the *entrance* pupil, whilst the image formed by the posterior portion is called the *exit* pupil. In the case of the eye, the virtual image formed by the cornea of the iris is the entrance pupil. It can easily be seen that it is the entrance pupil that is observed when one looks at a person's pupil. The exit pupil is the image of the iris formed by the crystalline lens.

Once the positions of the iris and the refractive constants of the eye are known, the pupils may be determined by the intersectional or vergence expressions described in preceding articles. This has been done in the table referred to above in which will be found the positions of both the pupil centres from the vertex of the cornea, the magnification and angular ratio for the same. It will be evident from the definition of the pupils that they are conjugate. Rays received by the entrance pupil will be delivered conjugately by the exit pupil.

Importance.

A knowledge of their function is of primary value in the interpretation of sight-testing measurements, indistinctness from incorrect focusing, depth of focus, illumination, etc. The following group of specific problems arise from their investigation:

A. Focus-Depth.

1. Construction of Test Types and their position

2. Estimation of refractive errors subjectively.

3. Near Point and Accommodation Amplitude.

B. Indistinct Focusing.

4. Amount of indistinctness, confusion or blur of the eye "fogged" by positive lenses and the relative progress on reduction.

5. Separately considered the relative progress of the gradual application of negative or myopic correcting glasses.

6. Vision with the aided eye.

7. Blurring of the ghost images formed by reflexion, either in spectacle lenses or the eye.

Closely associated with certain of these problems are physiological, psychological and physical considerations, rendering a complete investigation impossible at the present day. However, if care be exercised in realising the limitations of the geometrical investigation, it will be found that many, if not most, of the problems confronting the refractionist, may be solved from the general treatment given below.

Up to the present stage I have endeavoured to retain a general theory upon the questions bearing directly to ophthalmic work. It was observed in the last article that care must be exercised in the interpretation of schematic measurements. That the constants of the human eye should approximate to a certain average value is inevitable; but the recorded measurements on individual eyes show a spread well beyond the limits of experimental error. Now the optical state of an eye as at present estimated monocularly by refraction methods is only described as a relation existing between power of the whole eye and the position of the retina, the first consideration being to bring distance into focus when the eye is at rest by a lens placed as close to the eye as the eyelashes will permit with comfort. Thus refraction work at the present day does not give any details of the whole power of the particular eye under observation or of its parts. To determine completely the optical state of a particular eye is a laborious matter and is as yet in the laboratory stage. It is necessary then to employ the schematic average eye as a first approximation in the investigation of the complete action of spectacle lenses. Their particular application then must be attended with caution; their isolated ab-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

solute values cannot be regarded as normal (Dr. Tscherning) and their employment will only yield comparative averages. It is in consequence of these factors that the geometrical theory has been left in general terms which may be applied to any future development. When dealing with the specific theory of refraction, the average data will be assumed, but the influences of variations from them will be developed alongside.

Gullstrand's Fundamental Equation.

Helmholtz found it convenient to employ equation (19) Article II.

$$\frac{x}{p} + \frac{x'}{p'} = -1$$

the equation expressing the relation between the intersection distance measured from a pair of reference conjugate points situated x, and x' respectively from the focal points. The principal point and nodal point equations become particular cases of this equation.

Employing the corresponding capitals to denote vergences, the Helmholtz equation becomes

$$\frac{P'}{X'} + \frac{P}{X} = -1 \quad \dots \quad \dots \quad \dots \quad (43)$$

whilst equation (17) $\left[m = \frac{f}{x} = \frac{x'}{f'} \right]$ becomes

$$m = \frac{X}{D} = -\frac{D}{X'} \quad \dots \quad \dots \quad \dots \quad (44)$$

P and P′ will be the vergences referred to the conjugate reference points.

X and X′ will be the focal point vergences of the conjugate reference points whilst m is the magnification at the same. In order to distinguish the reference point from the current point we will a suffix $_0$ to the former, *i.e.*

$$\frac{P'}{X_0'} + \frac{P}{X_0} = -1 \quad \dots \quad \dots \quad \dots \quad (43a)$$

$$\text{and } m_0 = \frac{X_0}{D} = -\frac{D}{X_0'} \quad \dots \quad \dots \quad \dots \quad \dots \quad (44a)$$

Combining (43a) and (44a) it immediately follows that

$$\left.\begin{aligned} m_0^2 P' &= m_0 D + P \\ \text{or } P' &= \left(\frac{D}{m_0}\right) + \frac{P}{m_0^2} \end{aligned}\right\} \dots \quad \dots \quad \dots \quad (45)$$

If m be the magnification for the current points $m = \frac{f}{x_0 + p}$ and since $m_0 = \frac{f}{x_0}$ it follows

$$\frac{1}{m} = \frac{1}{m_0} + \frac{D}{P}$$

$$i.e. \quad m = \frac{m_0 P}{m_0 D + P} = \left(\frac{1}{m_0}\right)\frac{P}{P'} \quad \dots \quad \dots \quad (46)$$

Equations (45) and (46) may be called the Gullstrand Fundamental Equations.

For the *principal points*, $m_0 = +1$, and from (45) $P' = D + P$ which is the equation $A' = D + A$.

From (46) $m = \frac{P}{P'} = \frac{A}{A'}$

For the *nodal points* $m_0 = \frac{n}{n'}$, whence

$$P' = \left(\frac{n'}{n}\right)D + \left(\frac{n'}{n}\right)^2 P$$

which becomes, substituting the nodal vergences, $B = \frac{n}{b}$ etc.

$$B' = \left(\frac{n'}{n}\right)D + \left(\frac{n'}{n}\right)^2 B = N' + \left(\frac{n'}{n}\right)^2 B \dots \quad (47)$$

where N′ is the effective power at the second nodal point

From (46) $m = \frac{n'B}{nB'} = \frac{b'}{b}$ … … … (48)

For the *pupil centres*, in the Gullstrand No. 1 Static Eye $m_0 = .909$ which may be substituted in equations (45) and (46).

Equations (44) are instructive in that by definition (+) X_0 will be the effective power referred to the first reference point whilst $-X_0'$ will be the effective power referred to the second reference point, consequently if D be the principal point power, the power referred to any other conjugate point will be $\frac{1}{m}D$ and mD according to the direction. The second form of equation (45) becomes

$$P' = \frac{P}{m_0^2} + \frac{D}{m_0} = \frac{P}{m_0^2} + D_E \quad \dots \quad \dots \quad (45a)$$

where D^E is the effective power at the second reference point.

The Gullstrand equations give immediately the vergence expressions referred to the Toepler cardinal points, viz.:—

(*a*) the negative principal points, $m = -1$,

(*b*) the negative nodal points, $y = -1$.

With regard to the *angular ratio*, it was shown that, in general:—

$\gamma m = \frac{n}{n'}$ (see Art. 2, May 27, 1921, p. 191.)

For the conjugate reference point this becomes

$$\gamma_0 = \frac{1}{m_0}\frac{n}{n'} \quad \dots \quad \dots \quad \dots \quad \dots \quad (49)$$

$$\text{and } \gamma = \frac{1}{m}\cdot\frac{n}{n'} = m_0\frac{P'}{P}\cdot\frac{n}{n'} = m_0\frac{p}{p'} \dots \quad \dots \quad (50)$$

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Seven Styles

now made in

"OCENTRIC"

EYEGLASSES

BRITISH MADE.



A Distinctive Model for Each Individual Taste.

RIMLESS MOUNTS & FRAMES. G.F. & SOLID GOLD.

O series Short Plaquets Regular pattern

100 „ Normal Plaquets Regular Pattern

200 „ Long Plaquets Regular Pattern

300 „ For Centrally Drilled Lenses
(BENT UP PLAQUET ENDS.)

400 „ For Centrally Drilled Lenses
(CLAMPS ATTACHED BY SHORT BRACKET.)

700 „ For Centrally Drilled Lenses
(SWAN NECK BRACKETS.)

800 „ Regular Pattern with Double Straps

SAMPLES and PRICES WILLINGLY ON APPLICATION.

The British Ocentric Optical Co., Ltd.,

Wholesale and Manufacturing Opticians,

12 & 13, EAGLE STREET, SOUTHAMPTON ROW,

LONDON, W.C. 1

Telegrams—Ocentricco, Westcent, London. ***'Phone—Holborn 560***

Cables—Ocentricco, London.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

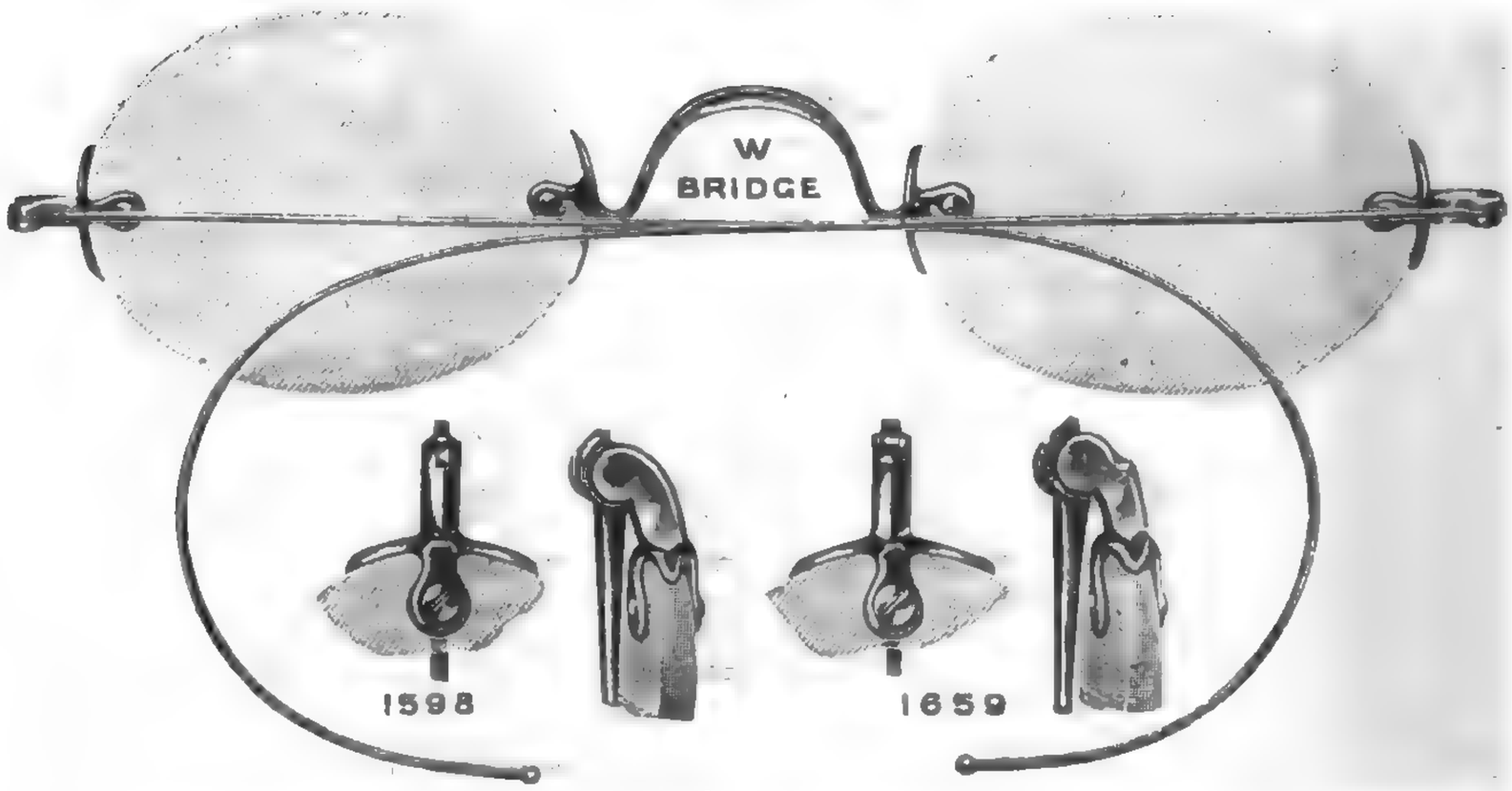
QUALITY FIRST

DUPAUL, YOUNG OPTICAL CO.,

ESTABLISHED 1888.

SOUTHBRIDGE, MASS., U.S.A.

Manufacture only Guaranteed Quality and Best Finish Gold-Filled and White Metal Spectacles, Eyeglass Frames, Astigs, Mountings and Materials.



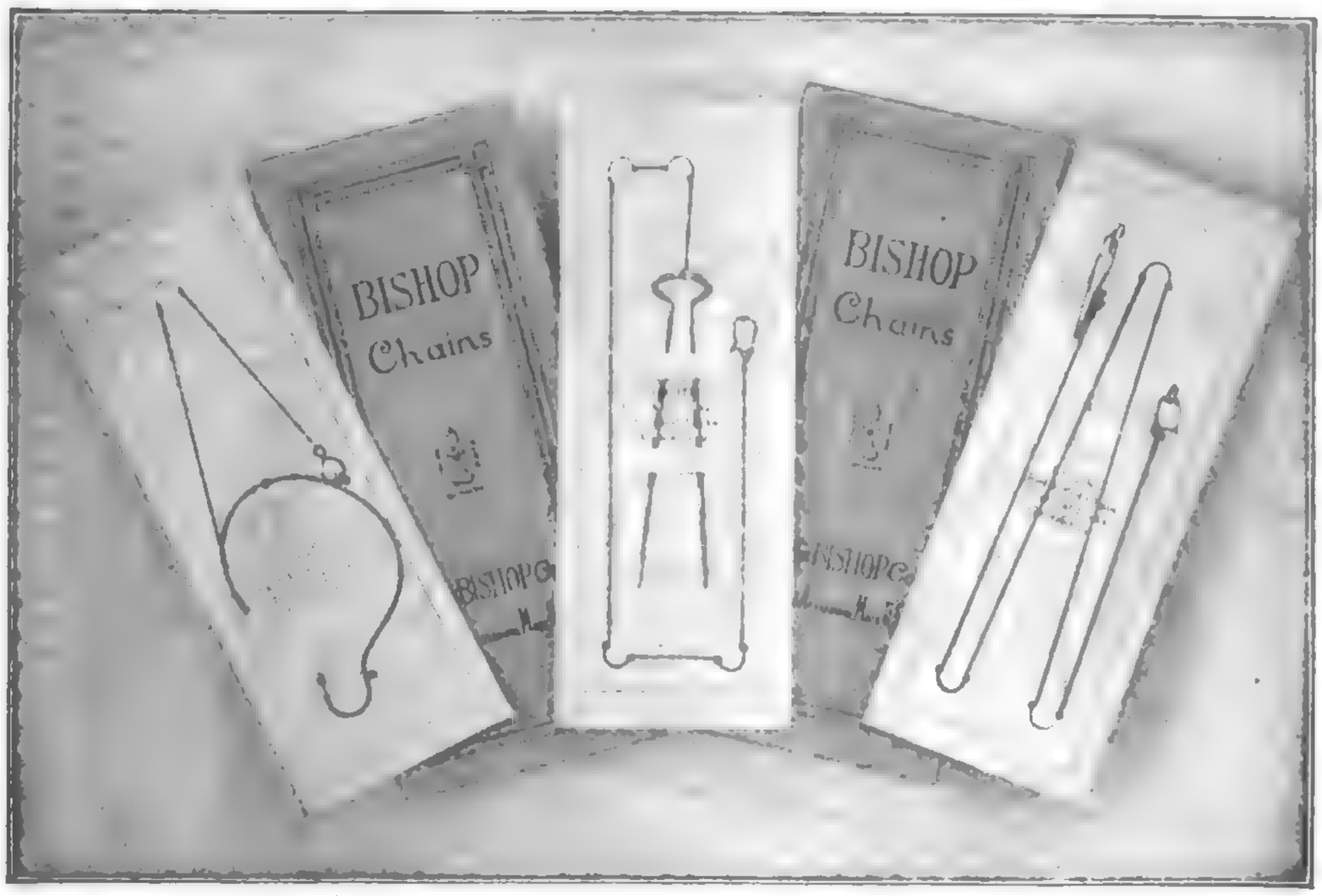
To be obtained from all Wholesale Optical Houses.

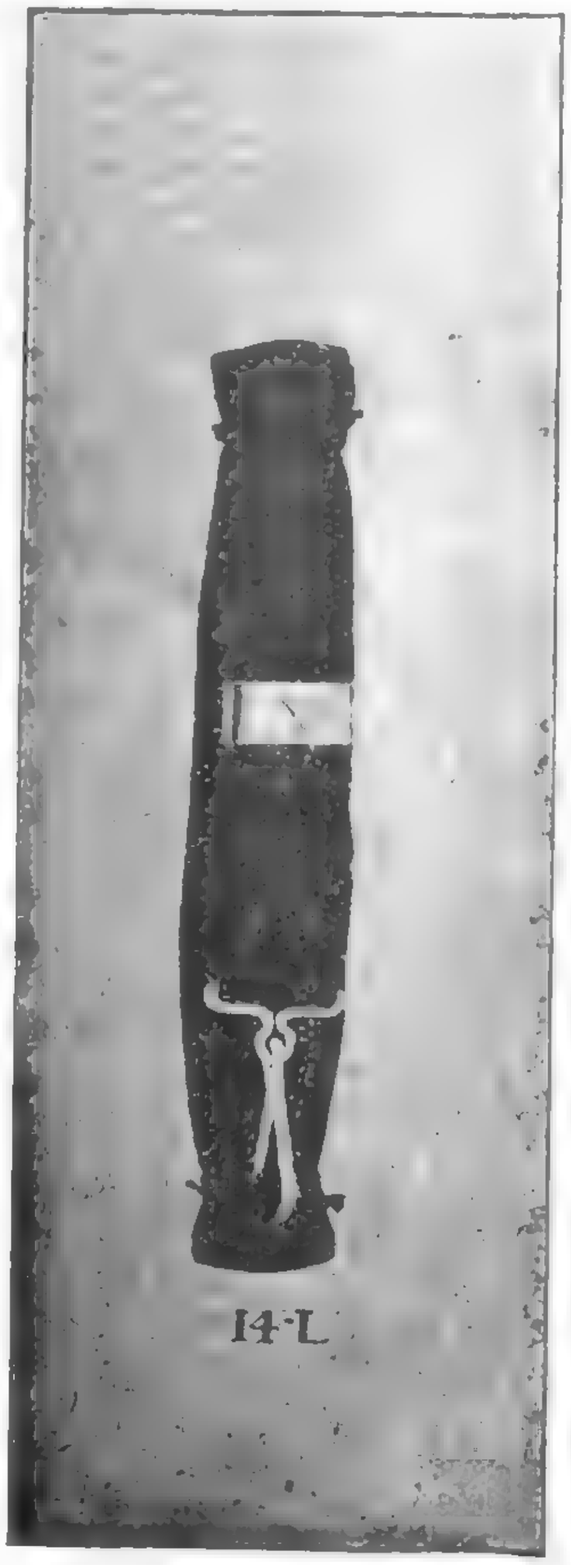
LONDON OFFICE: **S. PULZER,** 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. Telephone: CENTRAL 7241

Digitized by Google

Original from THE OHIO STATE UNIVERSITY





BISHOP CHAINS

should be your standard of Quality,
in solid Gold and Gold Filled,

BISHOP SILK EYEGLASS CORDS AND MONOCLE RIBBONS.

With Gold Filled, Silver or Gun Metal snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.



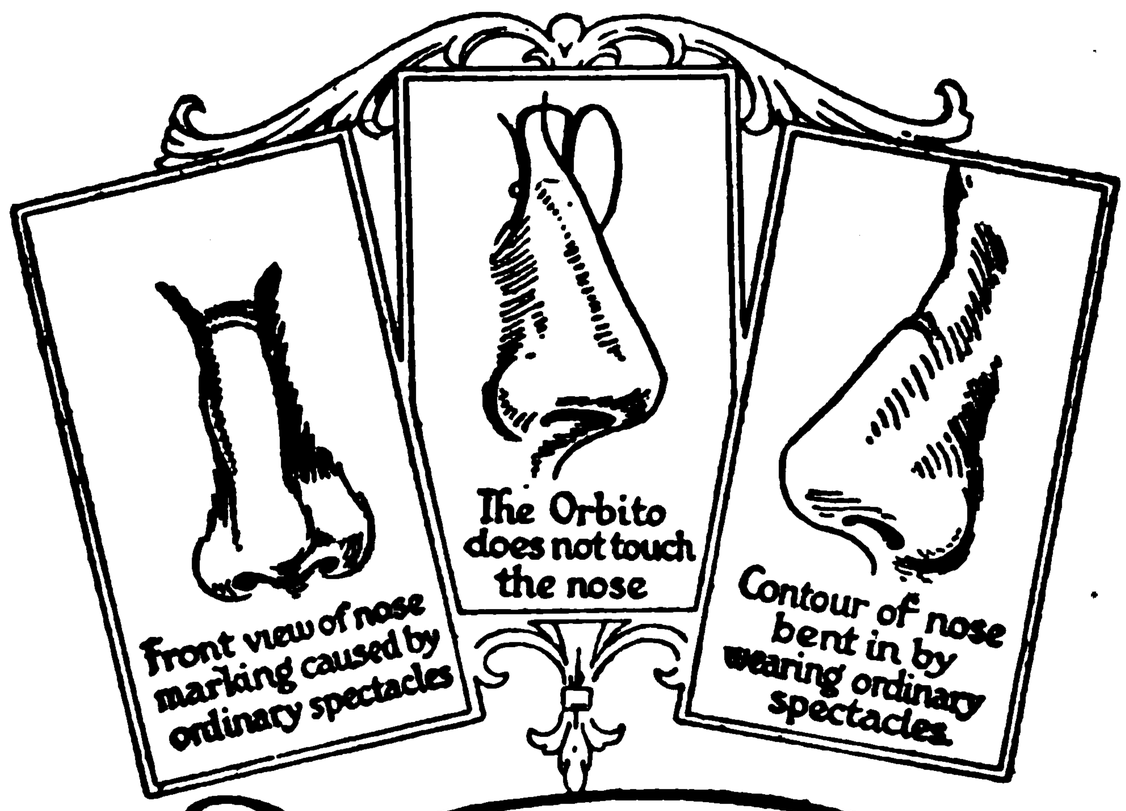
To be obtained from all Wholesale Optical Houses.

LONDON OFFICE S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Have You Seen Samples of Our Latest Products?



Orbito

The ONLY non-pressure Glasses

BETTER THAN EVER.

Gold and Shell
Gold Filled and Sheltex
Gold Filled 1/10 12-ct.
Solid Nickel
Hand Made Steel

} SPECTACLEWEAR-THAT SELLS ITSELF.

SEND FOR SAMPLES AND BOOKLETS TO THE INVENTORS AND PATENTEES.

Special Window Display Sets Supplied FREE.

OPTICAL PRODUCTS Co.,
WORCESTER STREET, BIRMINGHAM.

Manufacturers of Gold & Rolled Gold Eyeglass Chains.

TELE Phone 778 Mid:
Grams ORBIMOUNT.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Further from equation (18) we have

$$\left.\begin{matrix}\text{Axial or}\\ \text{Longitudinal}\end{matrix}\right\}\text{magnification} = -\frac{ff'}{x^2} = -\frac{x'}{x}$$

$$= \frac{m}{y} \quad \ldots \quad (51)$$

The axial magnification for the current point will consequently be given by equation (46) divided by (50) or

$$\text{Axial magnification} = \frac{\frac{1}{m_0}\frac{P}{P'}}{m_0 \frac{P'}{P}\cdot\frac{n}{n'}} = \left(\frac{1}{m_0}\right)^2\left(\frac{P}{P'}\right)^2\frac{n'}{n} = m^2\frac{n'}{n} \quad (52)$$

The value of equation (49) lies in the fact that it gives the inclination of the image ray in terms of the inclination of an incident ray passing through the first reference point.

Equation (50) gives the same for the current point.

Whilst equation (52) gives the relative shift of the image point corresponding with a small displacement of the current point. This equation will receive a more precise significance when applied to the pupil centres as the conjugate reference-points in the consideration of depth of focus and perspective.

Indistinct Focusing. Blur or Confusion Circle.

In fig. 10 is shown any optical system with pupil centres P_0 and P_0'. The point P is assumed to be in sharp focus at P'. A ray PE to the edge of the entrance pupil will emerge through E' in the exit pupil and will strike the axis P'. The plane through P is called the *focus* (Southall) or *field* (von Rohr) plane whilst that through P' is called the *screen* plane. In the language of ophthalmic optics they would be described as the planes through the point of fixation and the retinal point when these are conjugate. In the neighbourhood of P are the points P_1 and P_2 behind and in front of P respectively. Their corresponding image points will be mathematically in front and behind P' respectively. The limiting rays for these axial points are shown below the axis. The system is supposed centered and each ray will be the edge of a corresponding cone of rays.

Let the diameters of the entrance and exit pupils be $EE = 2\rho$, $E'E' = 2\rho'$. Denote the corresponding distances $P_0P = p$, $P_0P_1 = p_1$, etc., and the reduced vergences by the corresponding capitals. Rays emanating from the points outside the field plane will intersect the screen plane in circular "*blurs*" or "*confusion circles.*" If the physical stop be made infinitely narrow, these blurs would be reduced to points caused by the intersection of the screen plane by the single rays passing through the infinitely narrow entrance and exit pupils, *i.e.*, through the central points of these pupils. Such rays are called *principal* (haupt) rays or *chief* rays (S. P. Thompson). Such rays are representative of the directions of the incident and emerging cones. Let z' be the radius of a blur circle, then from similar triangles, considering as an example the ray from P_1

$$\frac{z_1'}{\rho'} = \frac{p' - p_1'}{p_1'}$$

$$\text{or } z_1' = \rho'\left(1 - \frac{p'}{p_1'}\right) = \rho'\left(1 - \frac{P_1'}{P'}\right) \quad \ldots \quad (53)$$

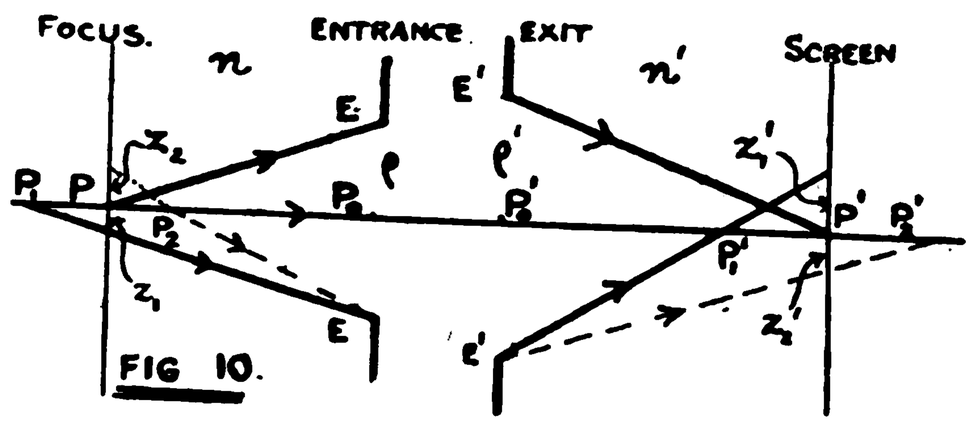


Fig. 10 shows that object and image space correspond so that

$$z_1 = \rho\left(1 - \frac{P_1}{P}\right) \quad \ldots \quad \ldots \quad \ldots \quad (53a)$$

The significance of this expression is that a circle of radius z_1 in the focus field plane will be in sharp focus on the screen plane and the size of its image will be identical with the blur circle produced by an object point P_1 situated $(p - p_1)$ from the focus plane. Precisely, similar argument applies to P_2 an object on the other side of the focus plane.

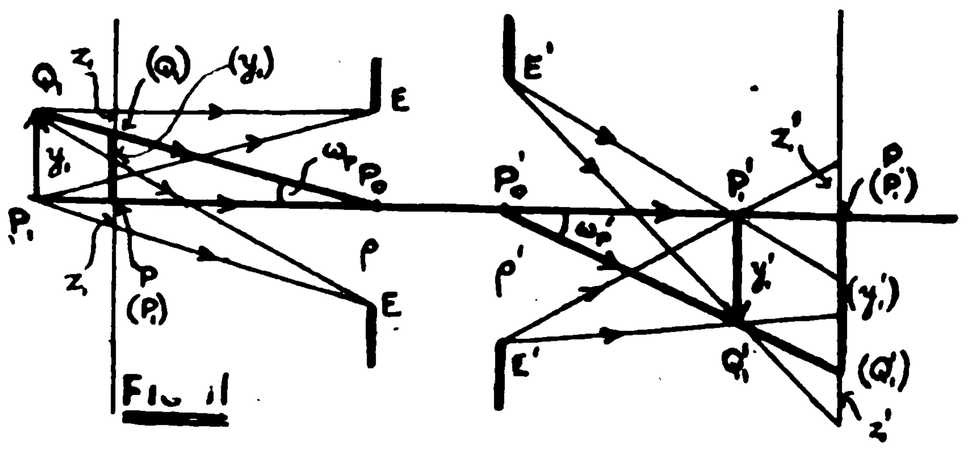


Fig. 11

Fig. 11 shows an object y, situated at the P_1 position of Fig 10, and a simple examination will show that the blurred image on the screen plane consists essentially of two parts, the blurred edges and the part (P_1') (Q_1'). This latter part is the size of the image on the screen plane as determined by the chief rays.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

(P_1') (Q_1') is generally described as the blurred image of the object outside the focus plane whilst the additional blur at both ends will be equal to the diameter of the corresponding blur circle.

Denote (P_1') (Q_1') by (y_1'), $P_1'Q_1'$ by y_1'

Then $$\frac{(y_1') - y_1'}{y_1'} = \frac{p' - p_1'}{p_1'} = \frac{P_1' - P'}{P'} \qquad (54)$$

since the position of (P_1') (Q_1') is in the P' Q' plane.

Correspondingly we have

$$\frac{(y_1) - y_1}{y_1} = \frac{P_1 - P}{P} \quad \ldots \quad \ldots \quad (54a)$$

This latter expression is called the *perspective elongation* on the object side. Literally, interpreted these expressions signify that objects placed before a system with infinitely narrow aperture will produce the same sized image on the screen plane if proportionately lengthened or shortened according to the above expressions. For finite apertures the blurring takes place according to (53) or (53a) in which case it will be seen that the perspective elongation is the multiplying factor converting the corresponding pupil diameter to the corresponding blur circle.

A Clinical Thermometer Sheath.

A recent issue of the 'Lancet' has called attention to the "James Thermometer Sheath." This sheath is a paper tube closed at one end, which is placed over the bulb and a portion of the stem of the clinical thermometer. When inserted into the patient's mouth the temperature is duly recorded, the thermometer withdrawn, and read. No cleansing is required, as the glass has not been in actual contact with the mouth. The sheath is ejected or removed by the patient. A further advantage is that, in the event of accidental breakage of the thermometer in the mouth, the sheath will hold. There is nothing deleterious in the sheath, as rice paper, gum arabic, and paraffin wax only enter into its composition. Obviously, the sheath must materially retard the correct recording of the temperature. Thus an unprotected thermometer registered a rise in temperature from 73° to 100° F. in 19 seconds, the same instrument under similar conditions, but covered with a sheath, requiring 60 seconds. The inventor thinks the sheath should be found useful to the busy physician passing from house to house during an epidemic. It would, however, be necessary first to determine that the retarded reading has no practical drawback.

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

The National Association of Opticians.

Sir,—In reply to the letter of "Orthodox" appearing in the previous issue of this Journal, while thanking him for his interest in the examinations to be inaugurated later under the auspices of the N.A.O., I cannot, until all their details are settled, do more than restate what has already been announced in the Special Issue of *The Optician*, that they will be Qualifying Examinations in Visual Optics and Sight-Testing, with such other additions of general and practical optics and pathological knowledge relating thereto, as expert opinion now demands. These examinations will be open to all individuals of good character, whether members or not of the N.A.O.

That the proposed Qualifying Examinations will be subjected to criticism goes without saying, but so long as that criticism is of a helpful, and not a captious nature, it will be welcomed by the N.A.O. Council, whose earnest desire is to make these examinations accord in the fullest practical way with the larger views now prevailing among the more distinguished members of the ophthalmic profession, of whom *not* a few are on the membership roll of the National Association of Opticians.

E. Moevius,
Hon. Sec. to the N.A.O.
17, Rathbone Road, Wavertree, Liverpool.

Fees for Sight Testing.

Sir,—Now that the examination fees and the annual subscriptions of the B.O.A. and S.M.C., have been increased, I feel that sight-testing opticians are perfectly within their right to make a charge of 10s. 6d. as a fee for testing. In the early days "Sight-testing free" was the rule, but if we are to make our calling a profession of respected standing, we must come to an understanding about our charges. Do you not think it would be advantageous for the Associations to issue a rule forbidding the "sight-testing free"

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Actual Manufacturers.

WILLIAM GOWLLAND, LTD.,

Optical Works, Morland Road, CROYDON, LONDON.

AND AT PARIS.

Price Lists on Application.

Telegraph: "Fundus, Croydon."

Telephone: 463 Croydon.



Digitized by Google

Original from THE OHIO STATE UNIVERSITY

WHOLESALE TRADE ONLY.

W. Smythe & Co. Ltd.

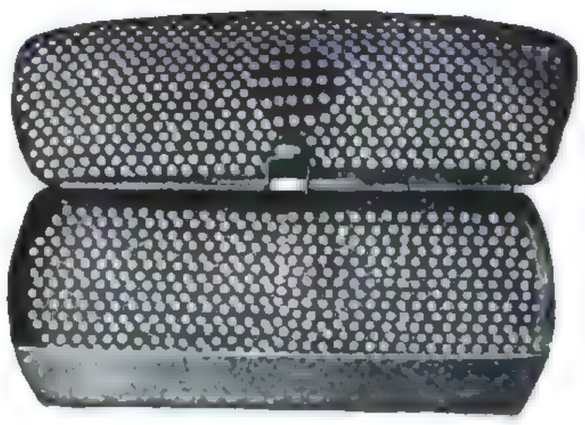
Head Office:
66 and 67, EDWARD ST. PARADE,
Birmingham.

Branch Works—HOCKLEY and WALSALL.

Patent Optical Case Manufacturers

Telephones: 5587-2354 CENTRAL. Telegrams & Cables: "NOWATE, BIRMINGHAM."

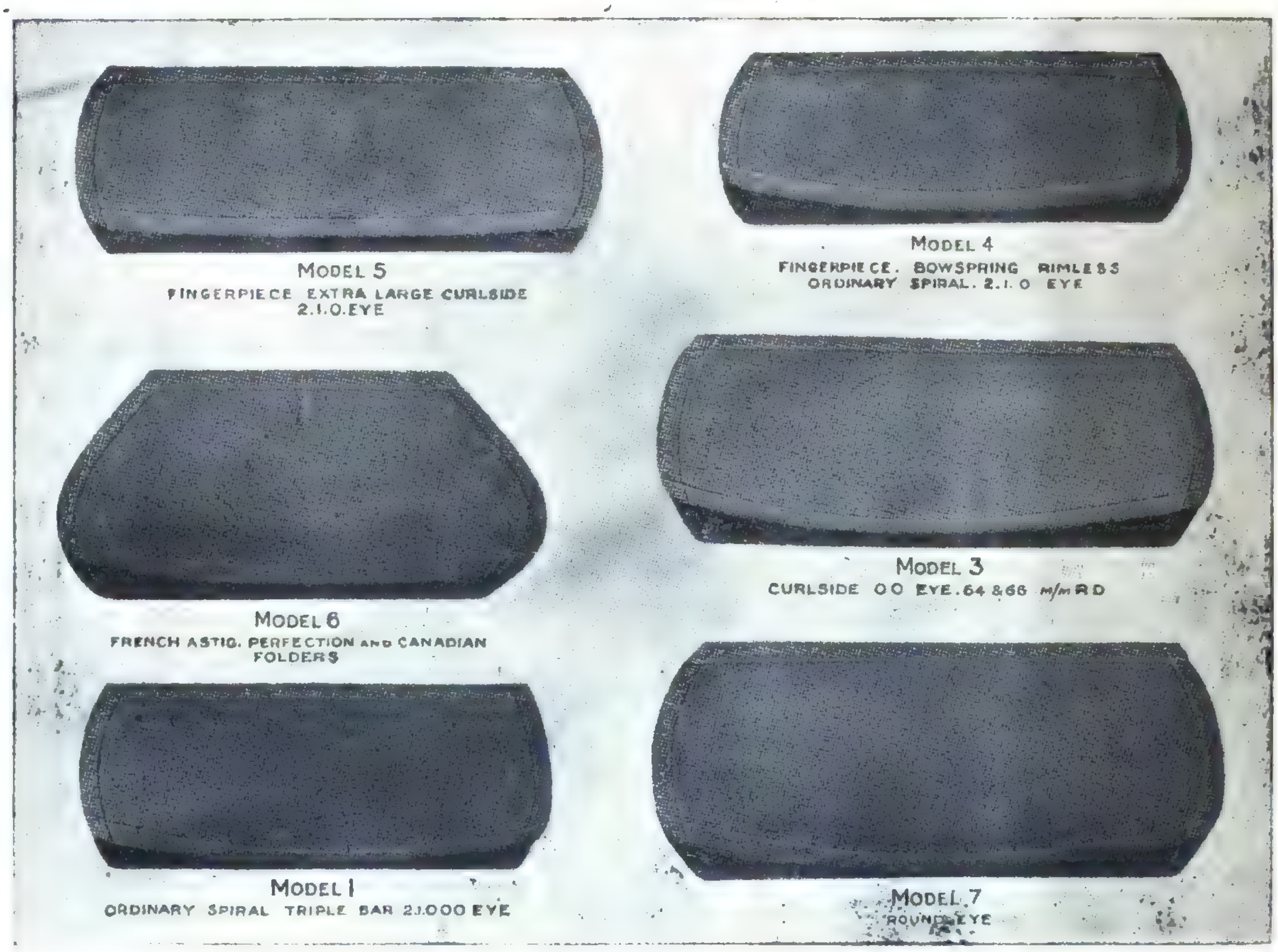
The Patent "NOWATE" Body



Advantages:

Light as Aluminium and Cheaper.
Stronger than Aluminium and Steel Bodies.
Leather and Lining does Not Peel Off.
Specially Suitable for Export and Hot Climates.

Patent Metal Spring Lid.



MODEL 5
FINGERPIECE EXTRA LARGE CURLSIDE 2.1.0.EYE

MODEL 4
FINGERPIECE. BOWSPRING RIMLESS ORDINARY SPIRAL. 2.1.0 EYE

MODEL 6
FRENCH ASTIG. PERFECTION and CANADIAN FOLDERS

MODEL 3
CURLSIDE 00 EYE. 64 & 66 m/m RD

MODEL 1
ORDINARY SPIRAL TRIPLE BAR 2.1.000 EYE

MODEL 7
ROUND EYE

ILLUSTRATIONS HALF-SIZE. COMPETITIVE PRICES.

Also Makers of Frogmouth and Soft Leather Cases. Write for List and Prices.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

notice? It has become possible for the public to obtain glasses at a very cheap figure, but the qualified opticians can hold their own if they will adopt the line I suggest. All of my patients receive an account, worded as follows:

"To one pair best quality gold filled spectacles, fitted with specially adapted meniscus curved lenses, for hypermetropia (and attendance). £2 5s. 0d."

This is placed in a clean envelope, together with my card, etc., and forms a constant advertisement, when shown to friends.

The optician cannot stand a small profit—his overhead expenses are too heavy, and glasses do not wear out like boots and hats. I should be glad to hear the opinion of other sight-testing opticians.

J. N. Arnold.

Glen Rosa, Kew Road, Richmond, Surrey.

Yearly Subscriptions.

Sir,—Will you kindly make it known to your readers that the Croydon members of the British Optical Association, together with several outside members, are protesting against the inflation of the annual subscription recently demanded by the Secretary of the British Optical Association.

We feel that this sudden jump from one and a half to three guineas per annum is both unreasonable and inopportune, particularly in the case of assistants whose salaries are as a general rule, strictly limited.

We would urge all member of the British Optical Association who are of the same opinion, to protest, either individually or to join with us in asking the Council to amend their decision, in a manner more favourable to assistant opticians.

J. W. Timmis.

On behalf of B.O.A. Members of Croydon and District.

79, Waddon Park Avenue, Croydon.

A Disclaimer.

Sir,—We have been approached by Mr. Henry Cahal, of 18, Sunbridge Road, Bradford, who trades in this City as "H. Cahal." Arising out of a report in a recent issue of your paper of a new Company which had been formed in a similar line of business, of which one of the directors was a Mr. Herman Cahal, of Manchester, an impression seems to have got about in this City that our client and the above mentioned director are one and the same person. This is not true, however, and on behalf of our client we shall be glad if you will kindly make known the fact that he has no connection in any shape or form with any other person, firm or company carrying on business as opticians.

Sugden, Dewhirst & Conchar.

24, Bank Street, Bradford.

A VIGNETTE.

By HENRY C. RAXWORTHY.

Scene: An optical retail establishment. Dramatis personæ: The proprietor, a commercial traveller, afterwards, a lady client.

C.T.: Good morning, sir, things looking up?

Proprietor: Good morning, Mr. Jones, might be worse, but I don't know I am open for anything to-day. Bought a line or two last week at manufacturers' cost for cash——

C.T. (*Grinds his teeth*): M-m.

Proprietor: I know the chap wouldn't make anything out of it, but that's not my funeral.

C.T. (*Opening his sample case*): There's surely something you're wanting, I have got a new line here that I came down specially to see you about. A new lens that'll knock spots off anything on the market. Cuts off ultra-violet rays; can be made flat, peris, meniscus, toric, Kryptok, U.B.C., at will; unbreakable; does not require surfacing—you keep a stock of blanks, a little machine and a set of tools. The blanks are placed in the machine, and the tools are operated with a small lever, and there's the lens ready finished for the mounting.

Proprietor: A sort of sausage machine?

C.T. (*Ignoring the base allusion*): We have a demonstration apparatus in our showrooms and should be delighted to have you come to see how it turns the work out. It's a wonderful piece of ingenuity. Come along the next early closing day.

Enter lady client

Proprietor: Good morning, madam.

Lady Client: I've come about my glasses, I've tried to persevere but they give such a pain at the back of my head, that they are of no use. I was recommended to come to you by Mrs. Smith because she said her glasses made her see better, and relieved her headache. I don't understand it. You charged me quite enough. I only paid 3s. 6d. for my last glasses at the stores.

Proprietor (*wearily*): Would you please step into the testing rooms (*exit lady*). To C.T.;

Digitized by Google Original from THE OHIO STATE UNIVERSITY

I shall have to see you another time. (*Proprietor walks to door with C. T.*). I wish your people would put a machine on the market for eliminating "come backs."

C.T.: I wish so too, and I wish also that someone would invent a machine useful to both of us, that would eliminate unfair price cutting.

Curtain.

The Spectaclemakers Company

51st Examination, November 1921.

Paper on Sight Testing.

Time allowed 3 hours.

1. Describe the lachrymal apparatus. What is the composition of the lachrymal secretion and what is its function?

2. Explain precisely what is meant by "spasm of accommodation." What optical defect does it simulate? State how you would recognise such a case and what measures you would adopt.

3. Give a description of retinoscopy with a plane mirror. What lenses would just reverse the shadow movements, working at 1 meter, when the right eye needs for its optical correction a -2.0 D. sph. and the left eye a $+2.0$ D. sph. $\bigcirc$ $+1.0$ D. cyl. 90°?

4. What is the meter angle? Has it a constant value, or on what does its value depend? What single prism of ordinary notation would cause a similar deviation of the eyes to a one meter angle convergence?

5. What is myopia? What are its causes and what different forms do you recognise?

6. What is meant by the terms "amplitude of accommodation" and "punctum proximum." The p.p. of a hypermetrope is at 20 cm. and amplitude of accommodation 8 D. How much hypermetropia has he and what, approximately, is his age.

7. Transpose into the best sphero-cylindrical form and into toroidal form with a base curve of $+6.0$ D. the following lenses.

(*a*) $+4.25$ sph. $\bigcirc -3.0$ cyl. 180°
(*b*) $+8.5$ sph. $\bigcirc +1.0$ cyl. 180°
(*c*) -1.25 sph. $\bigcirc -1.25$ cyl. 90°
(*d*) -8.0 sph. $\bigcirc +2.0$ cyl. 45°.

8. A myope of 15 D. has his crystalline lens removed. What is the optical effect of such a procedure and what lens would he require to enable him to read at 33 cm.?

9. What measurements would you require for making a spectacle frame? What difference would you make in a frame for reading glasses and one for shooting glasses?

10. Describe the perimeter. How is it used and for what purposes?

Eye Gymnastics.

It would not be surprising (says "A Physician" in the 'Daily Mail') if before long we see cricketers consulting eye specialists to improve their batting, golfers to reduce their handicap, and drivers of motor-cars to enhance their skill in dodging the traffic.

This not a mere fanciful suggestion. For some time past flying officers in the Royal Air Force have been sent to eye specialists to have their sight trained. And the success has been remarkable.

One test of a good pilot is the skill displayed in making " a good landing"; many pilots used to fail lamentably in this respect and this failure was generally ascribed to lack of skill and judgment.

But it was discovered that though these pilots might possess perfectly good vision they were generally handicapped by a defect in focusing the eyes steadily for near objects.

Many men who used to make "dud" landings have been through this course of eye gymnastics, with the result that they have astonished their instructors by making remarkably good landings afterwards. This condition—known as heterophoria—is a curable one.

The fact that its existence can be easily detected and generally cured or greatly improved, is of interest to great numbers outside the ranks of aviators. And it is of special interest to all whose pursuits or pleasures demand quick sight, rapid focusing of the eyes on near objects, and the power to maintain them in that focus.

Those who can do this have the power to judge angles accurately, and that is one essential in all games of skill.

This power has nothing to do with the range of vision for near objects or those at a distance; it has solely to do with the focusing or convergence of the eyes.

It is a muscular effort of the little muscles that move the eyes, and this can be trained and improved like any other muscular effort. It is easy with the aid of a friend to determine if you have any degree of this defect. If you are a "duffer" at games this defect may be explained.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

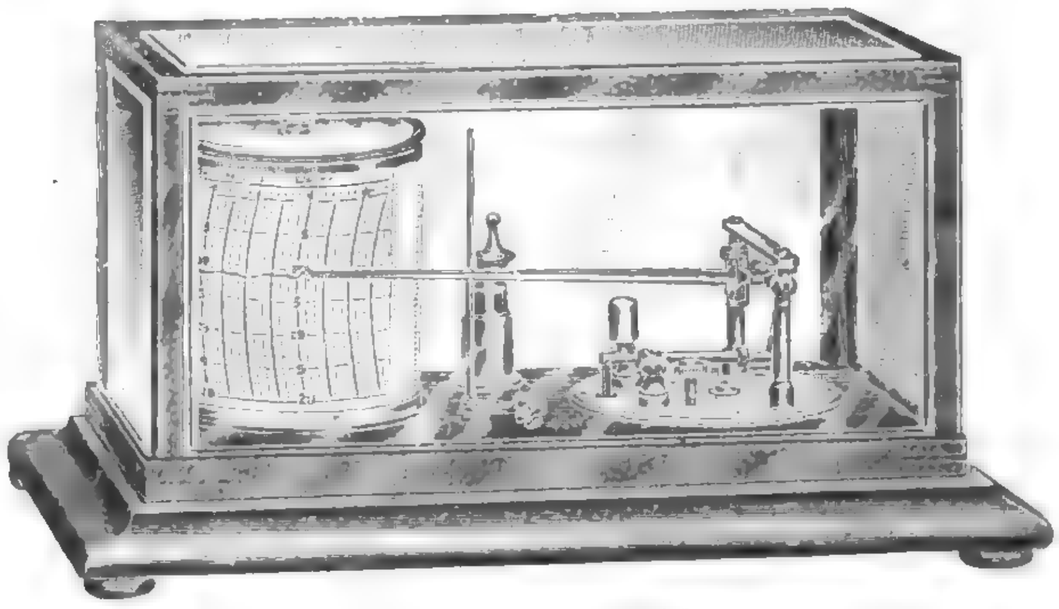
A POPULAR BAROGRAPH

of S. & M. Quality.

This first-class Recording Barometer combines an unusually high degree of accuracy with very moderate price. The Vacuum movement is concealed beneath the base plate, the whole construction being typically "S. & M." in simplicity and reliability. Available for prompt delivery, either in oak or mahogany case with glass cover, eight day clock and one year's supply of ink and charts.

The world-wide reputation of "S. & M." Scientific Instruments entails no penalty to the Retailer. Every sale shows a handsome profit.

Write for full particulars, terms and general booklet.



S. & M. No. 2318.

SHORT & MASON, Ltd., Aneroid Works, Walthamstow, London, E.17

Rx

SANDRO LOWY

Optical Rx Specialist,

88, Goswell Road,

LONDON, E.C. 1

Telephone: CITY 304 (two lines)

Telegrams: SANOPTIC, LONDON.

Rx

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

SCIENTIFIC INSTRUMENTS.

ACTUAL MANUFACTURERS.

"SOMCO"

OPTICAL MACHINERY and TOOLS.

SURGICAL & OPTICAL MFG. Co.,
22, Union Road,
CLAPHAM, LONDON, S.W.

OVERHAULS and REPAIRS

ENQUIRIES SOLICITED

THE

GLASSIE

LENS CLEANER

The "Glassie" Lens Cleaner is a neat advertiser for opticians.

It does its work THOROUGHLY:

A. It polishes.
B. It advertises.

Many opticians say it brings more business than their name blazoned in gold on a case does.

All progressive Houses have "Glassies."

Samples and Prices from your Jobber or direct from

THE GLASSIE LENS CLEANER Co
156 CHARING CROSS ROAD, LONDON, W.C.2.

The Mark Dacol *of Distinction*

Only High Grade and High Quality

BINOCULARS

have this mark.

Full particulars from
DAVIES COLEMAN & Co., Ltd.,
45 & 46, Fetter Lane,
London, E.C.4

Telephone: HOLBORN 2597.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Try the eyes of a friend or get a friend to try your own. Let him sit in a chair with the eyes directed horizontally forwards and facing a good light. Hold a pencil directly in front of him at the level of the bridge of the nose and at a distance of two feet. Tell him to keep his eyes fixed on it, and then gradually approach it to the nose until it is about two inches distant. *Watch his eyes closely as it approaches.*

If the defect is not present, the eyes will converge steadily on it; if it is present, one or other eye will wobble outwards as it gets near, according to the degree of the defect.

That condition can be cured, or at least improved, by a set of exercises for the eyes with a corresponding approach to what is called a "quick eye."

Radiations, Illumination and Colours.

By Dr. MAX COQUE, B.Sc.

II.—ILLUMINATION.

In a previous article (1), we have briefly investigated the subject of Radiation in a general way. We have now to study what happens when radiations strike a surface.

The various bodies we see around us are either self-luminous or are illuminated: the former are directly visible, whereas the latter are not and can only be seen if they receive visible radiations from a self-luminous body and have the power of scattering these radiations in the surrounding space.

By self-luminous bodies, we mean those bodies which, owing to their constitution or to the condition in which they are placed, communicate to the surrounding ether a certain amount of energy in the form of radiations. In other words, self-luminous bodies emit radiations. These radiations, on the production of which we shall revert later on with more details, are propagated in all directions and if they reach an observer's eye without undergoing any modification apart from the weakening which results from the distance, they communicate part of their energy to the retina and the observer sees the luminous body.

It may happen however, that these radiations, as they are propagated in space meet some media at the surface of which their movement is modified or by which they are more or less completely absorbed. If they strike a highly polished surface, the radiations change their direction of propagation according to the laws of reflexion and on reaching the eye, they will give the notion of the image of the luminous body by which they are emitted. If the surface considered were perfectly polished, a mechanical impossibility, the observer would take no cogaizance of the change of direction experiencer by the waves and would not be aware of the existence of the surface. Thus, to an individual who had never observed phenomena of reflexion, a plane and highly polished mirror placed vertically against the wall of a room would appear merely as an opening leading into another room precisely similar and similarly furnished and the observer would only be prevented from attempting to walk through this opening by encountering his own image as he would approach it.

If the surface on which the radiations emitted by a luminous body are received is not polished a totally different effect is produced: every point of the surface will send in all directions the radiations it receives: in other words ,the radiator or more exactly the ethereal waves, are scattered or diffused in the surrounding space and if they reach an observer's eye, they will enable it to see the point in the surface from which they apparently proceed. As the same phenomenon occurs at all the points in the surface on which the radiations are received, that surface becomes visible to the observer as if it were that of a self-luminous body. If the surface in question has no polish whatever all the radiations it diffuses, on reaching the observer's eye, will appear as if they were proceeding from the surface itself and the observer will merely see the surface and will have no notion whatever of the self-luminous body which is the real source of the radiations. As a rule, however, a given surface is neither absolutely reflecting nor absolutely diffusing and when such a surface is so placed as to receive radiations from a self-luminous body, it emits at the same time reflected light and diffused light. It is the latter which enables an observer to see the surface on which diffusion takes place, the former merely producing the sensation of an image (real or virtual) of the

(1) *The Optician*, Sept. 30th and Oct. 7th, 1921.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

source, provided, of course, that the surface be geometrically defined.

We cannot very well enter into full detail and give a complete explanation of the difference between reflexion and diffusion. The essential facts amount to this: Light or more generally the radiations emitted by a self-luminous body travel in space in the form of ethereal waves. Now generally speaking, waves striking any obstacle are always scattered in every direction but this scattering produces a regular reflected wave whenever the various elements of the surface of the obstacle are arranged in an even surface whose inequalities are small as compared to the wave-length. Thus, the sound waves produced by the ticking of a watch are about 25 mms. long: such waves are regularly reflected by a surface or an obstacle the inequalities of which are less than say a few millimeters; sound waves of 150 to 200 cms. are regularly reflected so as to produce a distinct echo by any obstacle the irregularities of which are not more than 20 to 40 cms. Light waves, *i.e.*, the radiations corresponding to the visible portion of the spectrum have a wave-length varying from about 800 $\mu\mu$ to about 390 $\mu\mu$ and, therefore, are well reflected by polished metal and polished glass, in which the irregularities of surface are of the same order of magnitude as the wave-length.

A piece of cardboard or even a sheet of glazed paper in which the surface irregularities though absolutely small are large in comparison to the wave-lengths of light, constitutes a bad reflecting surface. Generally speaking, the two phenomena, reflexion and diffusion take place simultaneously, the relative proportions of reflected light and diffused light depending on the degree of polish of the surface.

Confusing Reflexions.

In some cases, as for instance, when the reflecting surface consists of a sheet of ordinary white paper or of a fairly highly polished blackboard, it may happen that most of the light is scattered, only a small amount being regularly or almost regularly reflected and as this reaches the eye it only gives a vague impression of the image of the source or it may even happen that no proper image is formed. The reflected light enters the eye for all that and may prevent the observer from seeing the surface. When we simply look at an object without wishing to see its details, the above effect is of little importance, but in some instances, it may be extremely troublesome: everybody has observed that from some particular places in a lecture room, it is most difficult to read what is written on a blackboard; the whole surface or a part of it appears shining like a mirror and the writing on it is hardly visible.

When we look at two illuminated surfaces placed side by side, we may have two different sensations, the difference bearing on the illumination of the surfaces or on their colouration.

Let us consider the simplest case first and suppose that the two surfaces are of same colouration. According to the resulting sensations are equally intense or not, the illuminations of these surfaces are said to be equal or to be different.

[To be continued.]

New Company.

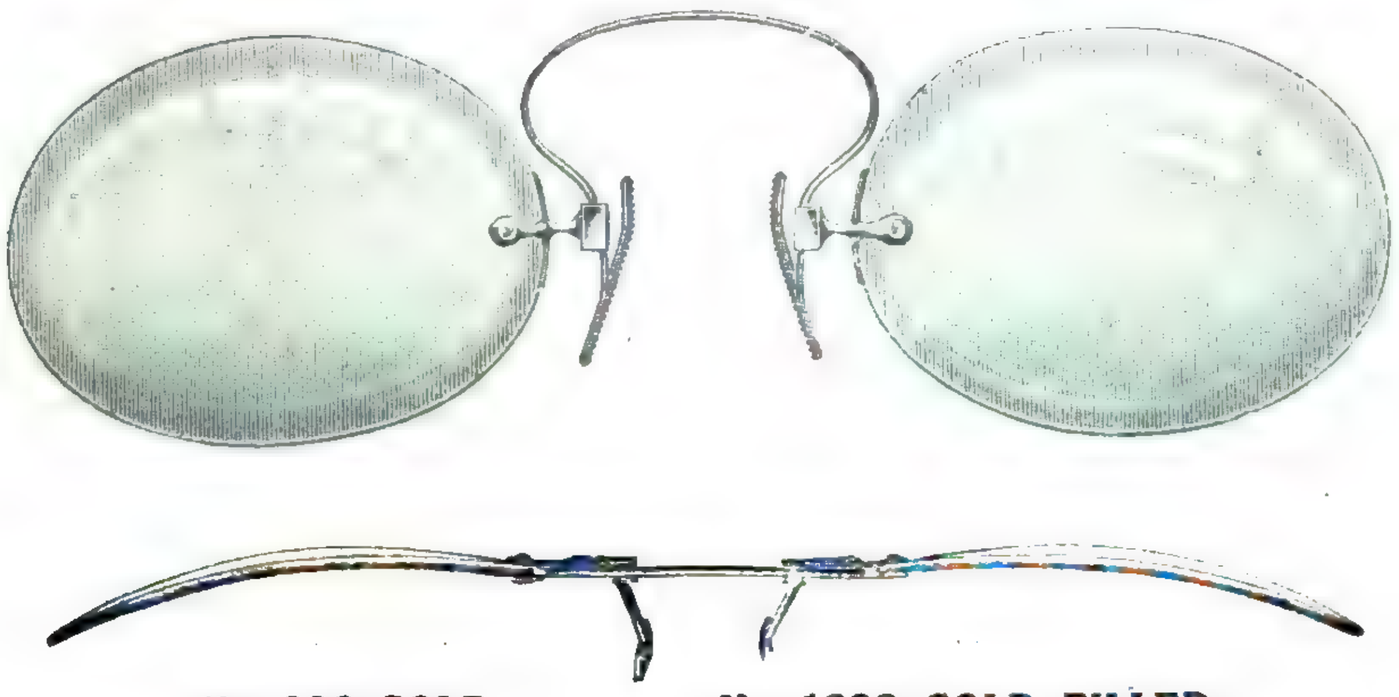
R. F. Hunter, Ltd.—Private Company. Capital, £3,000 in £1 shares. To acquire the businesses carried on at 9, Cavendish Circus, Buxton, and 3, The Promenade, Cheltenham, and to carry on the business of photographic chemists, camera and other photographic apparatus manufacturers and dealers, etc. The subscribers (each with one share) are:—R. F. Hunter, Mrs. M. M. Hunter and E. Grundy, 22, Booth Street, Manchester, C.A. The first directors are not named. Solicitor: T. R. Dootson, 6, St. Ann's Passage, Manchester.

The death of Mr. John Spiller, at the advanced age of 88, occurred on Tuesday of last week. Mr. Spiller was one of the most prominent investigators of the chemistry of photography in some of the earlier processes.

Football form was ever an unknown quantity, and a striking illustration of this was seen in the match between Bondwell (C. W. Dixey & Son), and Urswick Athletic on Saturday, November 12th. On October 22nd, at Lea Bridge Road, Urswick won 8—0; last Saturday on the same ground the "Bees" avenged their previous defeat by winning a hotly contested game. Bondwell gave their finest display this season, and all through the game outplayed Urswick, who had an unbeaten record. From first to last the "Bees" were easily the cleverer set of players. The home forwards played a really good game. The "Bees" fully deserved their victory. On Saturday, November 19th, the Bondwell F.C. will oppose G.P.O. Electric Light and Power Dept. Athletic F.C. away at North Finchley. Supporters are invited.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Lyon's
"Standard" Offset Mounts
For Accurate Fitting and Exact Alignment
Optically Perfect.



No. 893 GOLD No. 1293 GOLD FILLED.

Smart in Appearance and Comfortable to Wear.
Easily Adjusted.

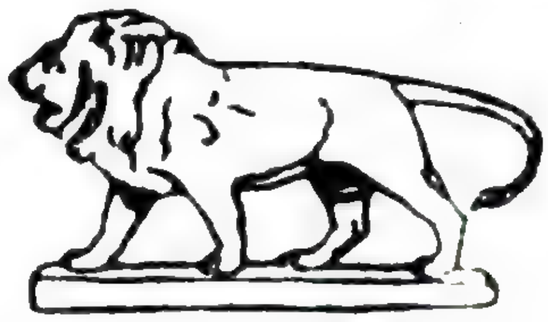
FULL STOCK OF STUDS, SPRINGS AND GUARDS. FITTING SETS SUPPLIED.

F. H. C. Lyon,

Wholesale and Manufacturing Optician,

59-61, Hatton Garden, London, E.C.1

Telegraphic Address:
CYLTORREXO, SMITH, LONDON.



Regd. Trade Mark.

Telephone No.:
HOLBORN 1203.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

"You Cannot TRADE SQ MARK *Buy Better"*

STEVENS' QUALITY Optical Goods

UNQUALIFIED approval meets this celebrated line wherever introduced.

WE are sole agents for the United Kingdom and can invariably supply your requirements from stock.

One Quality Only—The Best Made

1/10th 12ct. Gold Filled

Specialising in the Fingerpiece Mount

Send us your enquiries for
Spectacles and Eyeglasses—Frames and Mountings

Complete Catalogues on Application

H. WILLIAMSON Ltd.

Optical Section

87/89 GREAT SAFFRON HILL, LONDON, E.C.1

General Optical Supplies—Prescription and Repair Work—
Fittings and Instruments—Optical Machinery

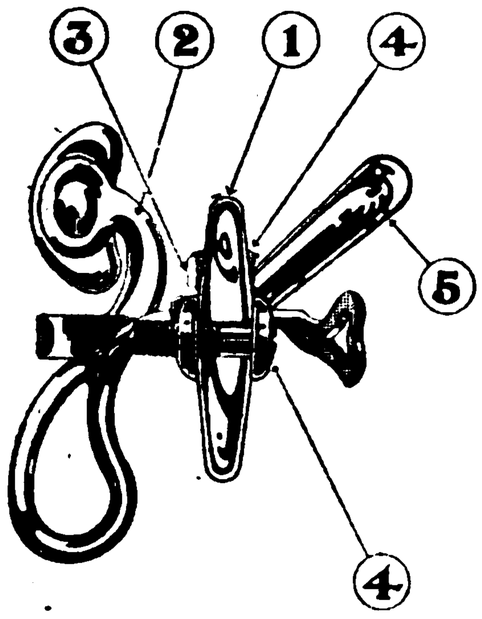
Digitized by Google

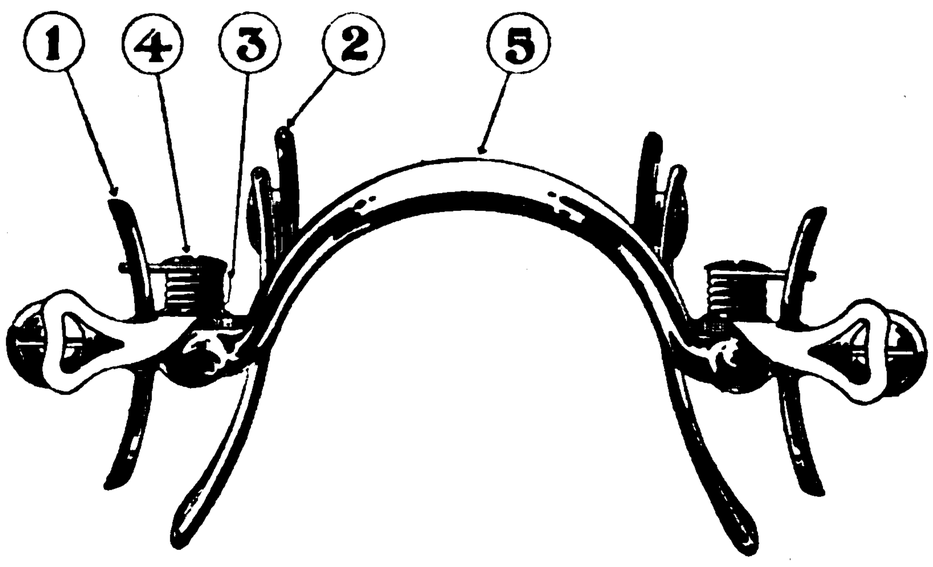
Original from THE OHIO STATE UNIVERSITY

TENNYSON OPTICAL PRODUCTS.

BRITISH MANUFACTURE.

THE FIRST PRODUCTION.





1.—STRAP. Supplied from 1½ to 5 m/m widths in ½ m/m variations. Each dimension is exact and the strap holds the lenses at the right plane to the eye in relation to the bridge.

2.—GUARDS. These are provided with movable top to prevent friction in wear and are adjusted so as to maintain a level and even balance.

3.—SPRINGS. A lever movement of the springs is located centrally, and the springs are so tempered that an equal pressure is given and maintained by either guard.

4.—SCREWS. The screws are specially made with a thread that will not allow them to work loose, resulting that lenses are firmly held.

5.—BRIDGE. The bridge is supplied in 27 Fittings, so that any type of nose may be fitted with accuracy and comfort.

THE "PRINCE" FINGERPIECE MOUNT.

This is, by common consent of leading optical authority, a finer production than any similar foreign article. In design it possesses points of distinct superiority, while in finish it conforms to the very highest standards, and is characteristic of British thoroughness in manufacture. You are an expert, consider its features indicated in the above enlarged diagram. This is a typical T.O.P. Line, and is designed upon a type which we feel represents the present trend of public choice.

ORDER THROUGH YOUR WHOLESALER.

THE "PRINCE" FITTING SET.

We shall be pleased to send you T.O.P. Illustrated Catalogue on application.

OPTICS Ltd.,

TENNYSON WORKS, WILLESDEN LANE, LONDON, N.W.6

WHOLESALE AND EXPORT ONLY

GUARANTEED BRITISH MANUFACTURE PRODUCTS

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

GOLD FILLED & NICKEL GOODS

ALSO

UNCUT LENSES

AT ASTONISHINGLY LOW PRICES.

QUALITY AND FINISH GUARANTEED.

SEND FOR PRICE LIST.

OUR RX DEPARTMENT IS UNEQUALLED FOR PROMPTNESS & ACCURACY.

Telephone: HOLBORN 1620 (Private Exchange).

KIRK BROTHERS WHOLESALE & MANUFACTURING OPTICIANS

Telegrams: KIRBROREX, HOLB. LONDON.

36, GRAY'S INN ROAD, LONDON, W.C.1



OPTICAL BLOCKS

To illustrate all features of Optical Service. Write for Lists.

Chemists' Design Service,
12, Humberstone Gate, Leicester.

DOING YOUR OWN EDGING?

Write us for

UNCUT TORICS.

Remarkably Low Prices.

APEX OPTICAL Co., Kidderminster.

PERCY S. DE SAULLES.

Manufacturer of . . .

MICROSCOPICAL GLASS SLIDES.

Micro Cover Glasses, Glass Cells and Cavity Slips, etc.

The Platts, Amblecote, Stourbridge.

C. BAKER 244 HIGH HOLBORN LONDON

REPAIRS

to all kinds of Scientific Apparatus carried out in our own Factory.

Estab. 1765 Work Returned Promptly. Charges Low

DIXON & HEMPENSTALL,
Wholesale and Manufacturing Opticians,
12, SUFFOLK STREET, DUBLIN.

Telegrams "Optics, Dublin."

W. P. THOMPSON, F.C.S., M.I.Mech.E., F.I.C.P.A. C. S. DYMOND, M.I.Mech.E., F.I.C.P.A

W. P. THOMPSON & CO.,
12, CHURCH STREET, LIVERPOOL.
Chartered Patent Agents.

H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A. J. V. ARMSTRONG, M.T.I., F.I.C.P.A.

T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and ABRONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
ESTABLISHED 1878 TELEPHONE CITY 419

RETAILERS who appreciate
PERFECT RIMLESS FITTING,
no loose screws—exact Measurements
Send to :
ROWLEY & Co.,
Deansgate, BOLTON.

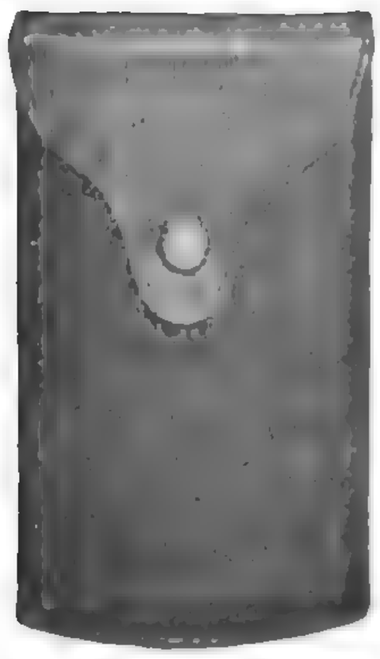
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Shur-on Glasses

Retailers!

Consider This For Bigger, Better Business



Want This?

It's a "Quality Beyond Question" Shur-on goggle case—a *flexible* one! We're so enthusiastic about it that we'd like to have you get one, without charge, to prove for yourself wherein it surpasses any goggle case you've ever seen. Just write for it, mentioning the name of your wholesaler.

When it becomes fixed in the minds of retailers that the name "Shur-on" on an optical product means "Quality Beyond Question"—and has meant that ever since 1864—then, there will be more—much more—satisfaction, measured in terms of comfort, becomingness and wearability, accompanying every optical sale.

Wise retailers are quick to realize the potential sales and good will value attached to a product of known and unvarying high quality.

If your wholesaler cannot supply you with Shur-on products, send us his name.

Shur-on Optical Co.,
Rochester, N.Y. U.S.A.

Quality Beyond Question Since 1864

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d. per word: for replies under Box No. 8d. extra.
Address of Office must he calculated as six words.

"Optician," 1920, 2 missing. Offers to White, 4, Weymouth Terrace, Acton Lane, N.W.10.

SUTCLIFFE Trial Frame wanted. Milner, Victoria House, Muswell Hill, N.10.

FOR SALE. Several lens measures. Write Box 3502, c/o "The Optician," 125, Fleet Street, E.C.4.

LENS Surfacing Machines. New. Half cost price. Marryat, Hatton Garden, London.

FOR SALE. 4 Thermometer dividing machines by Munro. Can be seen by appointment. Apply, "Divider," Box 3500, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

OLD Established opticians' business for sale in fashionable Devonshire seaside town, practically no opposition. Splendid opportunity for capable man. Low rent with house. Apply, Box 3501, c/o "The Optician," 125, Fleet Street, E.C.4.

FOR SALE. Old established optical business in main thoroughfare of Glasgow. Low rental. Apply, Box 3497, c/o "The Optician," 125, Fleet Street, E.C.4.

SIGHT-TESTING Business for sale. Growing, small opposition, good district near London, large scope. Price £160 inclusive of stock, etc. Box 3503, c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 8*

GOLD FRAME maker wanted. Must be thoroughly experienced and used to best quality work only. Box 5750, c/o "The Optician," 125, Fleet Street, E.C.4.

GLAZIER wanted for best flat and bevelled edged work. Box 5751, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST, 40, long sight-testing experience, retinoscopy and ophthalmoscopy, good salesman, impressive manner, seeks engagement. Reply, Box 5749, c/o "The Optician," 125, Fleet Street, E.C.4.

MANAGER wanted, age about 35. Good refractionist, workshop experience, permanent post, North of England. Reply, giving full particulars, experience, etc. State salary required to Box 5748, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED. Junior assistant. Write, stating age, experience and salary required to Aitchison & Co., Ltd., 38, Bucklersbury, E.C.4.

Elliott Optical Co.,

104 & 105 GT. SAFFRON HILL,

LONDON, E.C.1

TRADE EC MARK.

There is no Better House for

Rx Work.

RXS. RETURNED PROMPTLY, ACCURATELY DISPENSED and at REASONABLE PRICES.

Complete Outfit of Rx Stationery supplied, Free of Charge.

FINEST

ROUGH CYLINDER BLANKS.

Also good 2nd Selection
A very attractive proposition for Export and cheaper work.

CHANCE'S GLASS USED.

ACTUAL MANUFACTURERS

ASSOCIATED OPTICAL WORKS, Ld.

5, Queen's Buildings, London, W.1
Near Tottenham Court Road.
No Connection with any other Firm. **Telephone: Museum 2216.**

MANY SUCCESSES IN THE EXAMINATIONS!
Your Opportunity to

QUALIFY IN OPTICS

PRACTICAL WORK. Students taking the Course may receive personal tuition in the practical work AT ANY TIME DURING THE COURSE.

Expert Tuition by Correspondence for the SIGHT-TESTING DIPLOMAS of the Worshipful Company of Spectacle Makers (F.S.M.C.), or the British Optical Association (D.B.O.A.).

Write for full particulars—
C. A. SCURR, M.P.S., F.S.M.C., F.I.O., etc.
64, High Street - - - - BARNET.

TO LENS MANUFACTURERS

For Disposal (In Perfect Condition)

1 12 Spindle Machine for Bi & Cyl. Lenses
1 20 „ „ „ Meniscus „
1 10 „ „ „ Deep Bi, Peris & Meniscus Lenses

Together with Blocks.

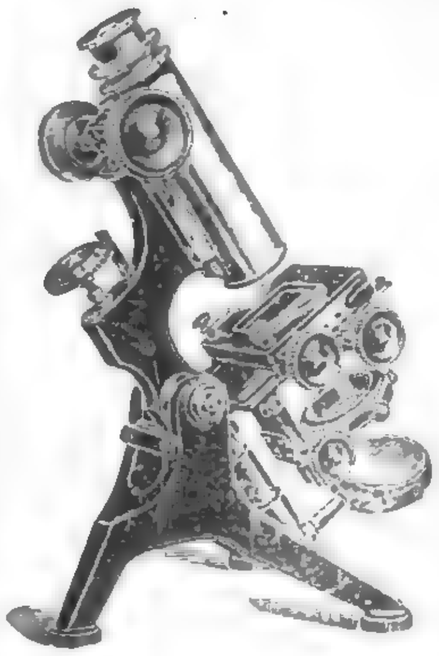
Full particulars on application to Box 5742, c/o "The Optician," 125, Fleet Street, E.C.4

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

SELL WATSONS'
BRITISH-MADE
MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,
313, High Holborn, W.C. 1
Works: High Barnet, Herts. Established 1937.

WILLESDEN IS A BIG PLACE

There is more than one Optical house in Willesden but only one W.O.W.

We are not connected in any way with other Optical concerns in Willesden or elsewhere.

Keep W.O.W. distinct in your mind.

Think of quality and W.O.W. as synonymous terms—and you are right.

WILLESDEN OPTICAL WORKS, LTD.
LENS FACTORY:
DUDDEN HILL LANE, N.W.10

The Prefix is alright but what really counts is
THE SUFFIX

Crookes glass dates back to say 1913, and made by anyone is original and genuine, but it is important to remember that applies only to Sir Wm. Crookes A and B Glass. Since that date much water has flowed under London Bridge and Sir William only ceased his labours when he brought out his *Ultimate* Glass—the result of his long years of research. The only genuine Crookes Ultimate is made by—

SIR WILLIAM CROOKES ULTIMATE ANTI-GLARE GLASS CO., LTD.,
30, WIGMORE STREET, LONDON, W.

REMEMBER THE SUFFIX—ULTIMATE.

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,
DANDURAND BLDG., MONTREAL.
Cable "Optical" A.B.C. Code 5th. Edition.

Worshipful Company of Spectaclemakers.

Tuition for the Company's Examinations in Optics and Sight Testing at
THE SCHOOL OF OPTICS Ltd.

2, GUILFORD PLACE, LONDON, W.C. 1
Particulars on application.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

A.—**Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

FIRST-CLASS fitter and surfacer requires situation (male), served apprenticeship. Box 5746, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED. Quick and accurate refractionist. Good opportunity for smart man. Apply, to Messrs. John Anderson's Royal Polytechnic, Ltd., Optical Department., 07/105, Argyle Street, Glasgow.

EXPERIENCED dispensing optician desires re-engagement as manager or assistant. Over 20 years' experience of high-class work with leading dispensing house. Capable salesman and fitter. Box 5744, c/o "The Optician," 125, Fleet Street, E.C.4.

JUNIOR assistant wanted by well-known Yorkshire optician. Must be capable workman. Part time workshop and assist counter and consulting room. Box 5745, c/o "The Optician," 125, Fleet Street, E.C.4.

SECOND YEAR Student at Northampton Polytechnic seeks situation with optician familiar with prescription work. P.V.T., 292, Lancaster Road, W.11.

WANTED by qualified optician, responsible position offering scope for accurate refraction, first-class salesmanship and energetic organising. In or near London. Box 5752, c/o "The Optician," 125, Fleet Street, E.C.4.

MANAGER F.S.M.C., 35, tall and good address, married, desires appointment requiring ability and initiative. 20 years' sound all-round experience in London and provinces. Box 5756, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED. Tortoiseshell spectacle and lorgnette maker for London firm. Must be a good man at repairs. State salary and experience to Box 5755, c/o "The Optician," 125, Fleet Street, E.C.4.

MANAGER wanted for optical and sundries business with a view to purchase. Country town 25 miles from London. Write, stating terms and experience, in the first instance, to J. and H. Taylor, Ltd., 19, Red Lion Street, Clerkenwell, E.C.1.

D.B.O.A. (young) desires position with Manchester (or district) firm. First class experience and sound knowledge of practical work. Box 5754, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED an assistant well up in sight-testing. State full particulars, salary required and where last employed (in confidence). Box 5753, c/o "The Optician," 125, Fleet Street, E.C.4.

WORKSHOP. Smart man wanted, capable doing all classes repairs, glazing, mounting, etc. Permanent. North of England. State full particulars, abilities, experience, salary required. Box 5747, c/o "The Optician," 125, Fleet Street, E.C.4.

GOOD All-round jobber required with experience in rimless glazing. Box 5743, c/o "The Optician," 125, Fleet Street, E.C.4.

WATCHMAKER, improver, studying for S.M.C. exam. desires position with jeweller-optician. J. F. Hutchings, 42, High Street, Wincanton, Somerset.

POSITION required by one experienced in block and prescription work. Able to take charge of either. London or suburbs only. Box 5735, c/o "The Optician," 125, Fleet Street, E.C.4.

SIGHT-TESTING. Situation wanted, 30 years' experience, sole charge, can do repairs. B., 96, Hawthorne Street, N.F. Pool, Leicester.

ASSISTANT (D.B.O.A.), with considerable experience seeks position in the Midlands. Capable of taking charge. Box 5734, c/o "The Optician," 125, Fleet Street, E.C.4.

GOOD All-round gold worker, frame and rimless, or representative for wholesale firm, excellent references. Box 5738, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. first assistant, desires change. Capable refractionist, also fully practical. North preferred. Particulars and salary to Box 5737, c/o "The Optician," 125, Fleet Street, E.C.4.

RELIABLE Sight-tester, workshop experience, would like to travel for wholesale firm. What offers to Box 5732, c/o "The Optician," 125, Fleet Street, E.C.4.

COMPETENT refractionist seeks berth as an assistant for sight-testing department. Would consider part assistant and part workshop. Box 5733, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Man requires situation in London. 4 years' experience in workshop and sight-testing. Box 5741, c/o "The Optician," 125, Fleet Street, E.C.4.

SMART Assistant required, good refractionist with bench experience. Full particulars, references, etc., to Ryan, 65, Dublin Road, Belfast.

PROFESSIONAL Optical Organisation requires Secretary, capable organiser, knowledge of optical trade preferable, part time service to commence. State age, experience, salary required and full particulars to Box 5731, c/o "The Optician," 125, Fleet Street, E.C.4.

OPTICAL and Mechanical instrument maker desires change, 10 years' experience in the manufactory. References. Scottish diploma for sight-testing. Box 5729, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACER, 24, seeks situation. Thoroughly accustomed to prescription work. T.D., 251, East India Dock Rd., E.14.

EXPERIENCED Young lady required for prescription department. Box 5736, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG LADY, 20, requires situation as invoice or account typist. 3½ years' experience. W.W., 52, Fitzroy Road, Regent's Park, N.W.

QUALIFIED refractionist, 30 years' experience in workshop, testroom and fitting, would accept berth as manager or under-manager. Box 5740, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED. Rimless driller and fitter, able to set and adjust to measurements as ordered. Box 5726, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED. Shell and gold worker for repairs and adjustments. Box 5727, c/o "The Optician," 125, Fleet Street, E.C.4.

METEOROLOGICAL and Scientific Instrument Maker, disengaged, requires position, maker or repairer, hand-turning, bench work, finishing, lacquering, own tools. 18 years' experience, any distance. F. Orford, 83, Ashmore Road, Paddington, W.9.

EMPLOYER can recommend a thoroughly reliable and qualified manager, for a similar position. Apply, Box 5719, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., D.B.O.A. (21), seeks re-engagement in London district. Box 5718, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS All-round gold worker requires situation, used to taking charge. Town, country or abroad. Apply, Box 5716, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED for India by Walter Bushnell, Ltd. A young single man, B.O.A. or S.M.C. State age, experience and fullest details re experience, character, etc., in strict confidence to Box 5717, c/o "The Optician," 125, Fleet Street, E.C.4.

Concluded on page 6.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE MIDGET



OPERA GLASS

(Licensed under Patent 12148 1912.)

(Actual size of Illustration.)

Perfect Interpupillary Adjustment.
Superior Lenses.

Claims immediate attention and commands ready sale.

Choice variety:—BLACK MOROCCO, GILT, FANCY LEATHER, PEARL, etc.

WRITE FOR SAMPLE.

R. ARCHER & SONS, Ltd.,

1, AMWELL STREET, LONDON, E.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

AMERICAN·OPTICAL·COMPANY, LIMITED

THE AOCo NAME PLATE
Is Your Protection.



No matter how great or small your practice may be; no matter whether it is done in an office, a store, a hospital, there is a Wellsworth Trial Set particularly adapted to **your** special needs.

You can obtain such a set from your regular wholesaler. In the interests of your own protection, we suggest you look for the little AOCo name plate.

WELLSWORTH

TRADE (A) MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C.4. Printed by The Century Press, Fulham. Nov. 18, 1921.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1600 FRIDAY, NOV. 25, 1921.

ROSS BINOCULARS.



British Government Tests have proved these to be the finest Binoculars in the world.

Send for our new catalogues and terms.

ROSS Ltd., Clapham Common, LONDON, S.W. 4

ELLIOTT'S Rx SERVICE

leaves nothing to be desired.

ACCURACY—PROMPTNESS and REASONABLE PRICES.

104/5, GT. SAFFRON HILL, E.C. 1



STOCK OPERA GLASSES NOW—

For Pre-duty Prices.

For the Coming Season.

ARCHER SELECTION.

R. ARCHER & SONS, Ltd., 1, Amwell Street, London, E.C.1

Reg'd at the G.P.O. as a newspaper PRICE 4d Subscription post free 12 months 7/. Postage in United Kingdom 1d

Digitized by Google Original from UNIVERSITY

AMERICAN·OPTICAL·COMPANY, LIMITED.



AS STRONG AS ITS WEAKEST LINK,



And as good as its poorest link, too. You can say that about any chain. What you must know is how good the poorest links are, or better still, buy WELLSWORTH EYEGLASS CHAINS and eliminate the necessity of considering this matter at all. You can have the same confidence in Wellsworth Chains that you have in Wellsworth Lenses, Wellsworth Cases, or any other staple item you are using.

We want you to know and appreciate that we have always made the best Eyeglass Chains, and are making them to-day.

WELLSWORTH

TRADE MARK (Regd).

OPTICAL PRODUCTS.

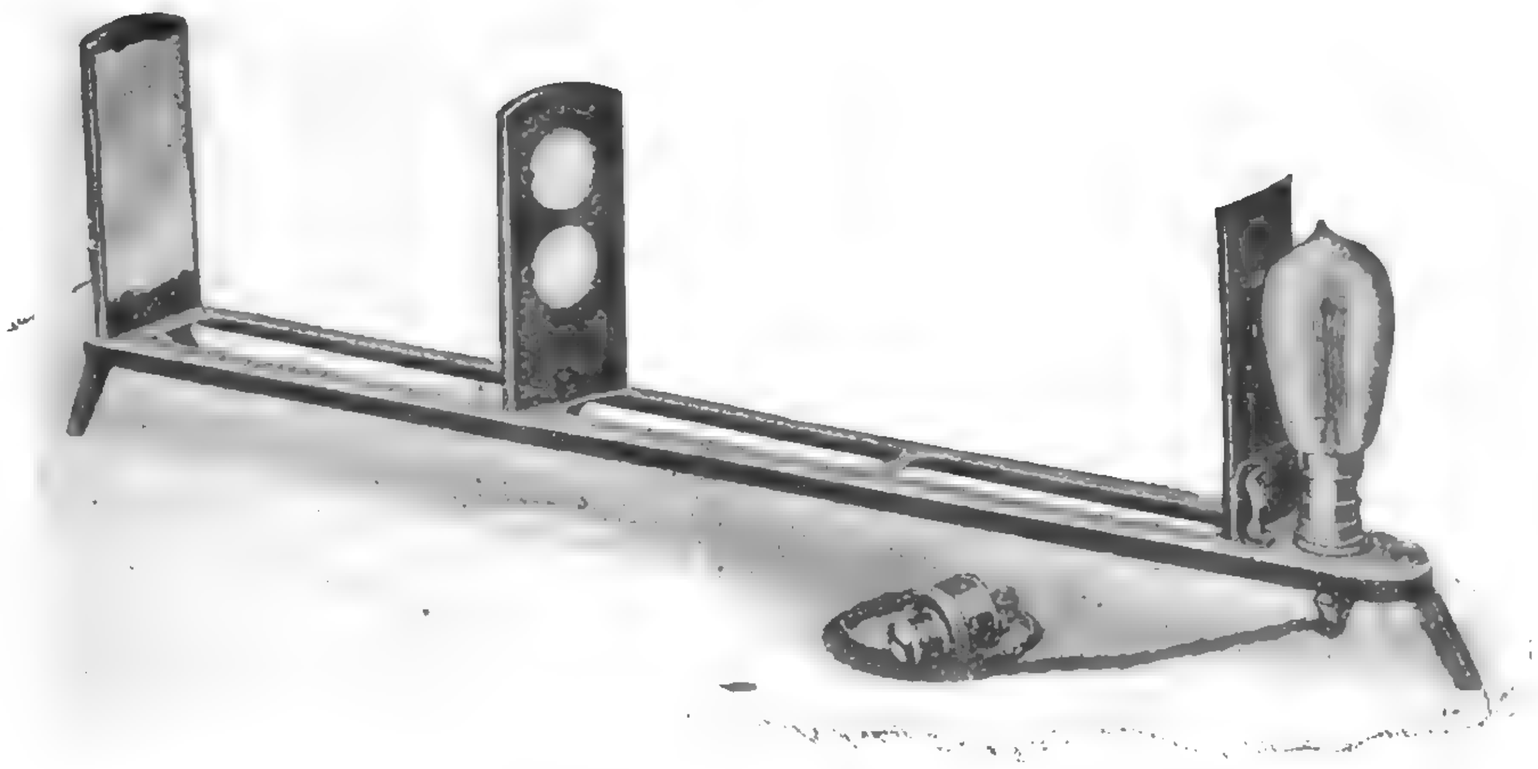
Offices, No. 39 Hatton Garden, E.C., LONDON

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The "RAPID" Curved Lens Demonstrator

Patent No. 112074



A MOST CONVINCING DEMONSTRATION OF THE ADVANTAGES GAINED BY USING TORIC OR MENISCUS LENSES IN THE PLACE OF BICONVEX OR BICONCAVE.

Particulars and Price on Application.

GEORGE CULVER LTD.,

Manufacturing Opticians,

PENTONVILLE, N.1

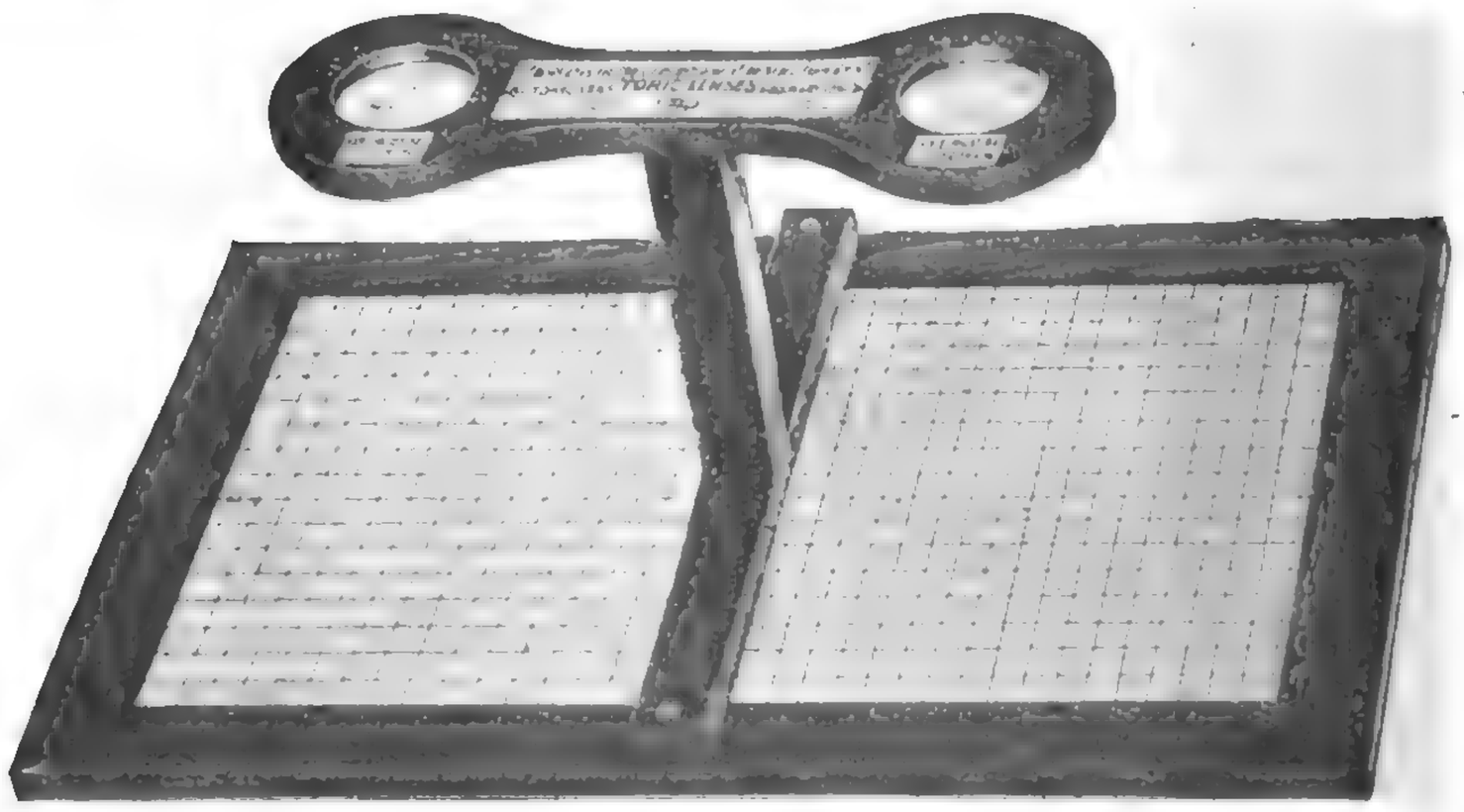
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

J. & R. FLEMING LTD.

SIMPLIFIED FORM OF

TORIC DEMONSTRATOR



Designed for the Counter or Waiting Room Table.

Demonstrates itself.

No time lost explaining elaborate apparatus to clients.

No lights or working parts to get out of order.

Inexpensive.

Particulars on Application.

J. & R. FLEMING LTD.,

Telephone:
HOLBORN {814 / 815}
HOLBORN {2788 / 2789} Prescription Dept.

136-148 Clerkenwell Road,
LONDON, E.C. 1.

Telegrams:
"OTTICO." LONDON.

Branches with Prescription equipment:

WALTER BRAHAM & Co. Ltd.
6, Key Hill Drive,
BIRMINGHAM.
Phone: Central 2509
Telegrams: "Brahma."

37, WESTGATE STREET,
CARDIFF.
Phone: Cardiff 44
Telegrams: "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1085.
Telegrams: "Ottico."

8, SHUDEHILL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

J. & R. FLEMING LTD.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
The Rt. Hon. VISCOUNT HILL, L.C.C.

Upper Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Renter Warden
HARRY HYLTON-FOSTER. Esq., Past Master.

Director of Examinations
The Rt. Hon. SIR WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in May, 1922.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT·MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,600

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, NOV. 25, 1921.

The Spectaclemakers Company.—Our attention has been drawn to a statement by a correspondent, Mr. J. N. Arnold, of Richmond, Surrey, in *The Optician and Scientific Instrument Maker*, of the 18th inst., alleging that the examination fees and the annual subscription of the Spectaclemakers Company have been increased. This is not correct. We are informed that the Spectaclemakers Company has neither increased the examination fees to candidates, nor raised the annual subscription of its diplomates, namely, 4s. quarterage per annum. References to the fact are made also in our correspondence columns this week.

* * *

British Advertising.—At the recent Medical Exhibition in London, displays by continental scientific instrument makers were very noticeable; but stands of some of the largest British makers were conspicuous by their absence. While there is no doubt considerable enterprise shown here in the design and construction of new models, there is, we think, rather a lack of advertising enterprise, which has been in no small degree responsible for the

Digitized by Google Original from THE OHIO STATE UNIVERSITY

fact that British manufacturers have been so hard pressed by some of their competitors in the strictly commercial field. In support of this idea, we find it remarked in a Government "Report on the Conditions and Prospects of British Trade in Canada," that it is essential for British exporters to that country to "do more advertising." Though there is a growing tendency among United Kingdom manufacturers to admit a certain amount of advertising as necessary, comparatively few of them go about it in the right way. In some cases they stipulate that their Canadian agents must see to advertising locally, and carry it out at their own expense out of their commission. In other cases agents are informed that an extra percentage will be allowed to cover advertising expenses after their sales have reached a certain amount. "There is overwhelming proof that both these methods are wrong, and that the manufacturer himself must do the advertising."

* * *

We fully agree with Captain Edwards, the Canadian Trade Commissioner, that the ex-expenses of advertising should properly fall on the manufacturers of all goods of a distinctive character—such, for instance, as optical instruments that are of an exclusive design, or branded spectacle ware, and so on. It is surely a mistake for the manufacturer to pass on to wholesale houses, or even an exclusive agent, the financial responsibility for that trade advertising which is so necessary. The thing can be done, and is done; and the result must certainly be that such advertising is reduced to a minimum; for no merchant or manufacturers' agent can feel quite the same permanent and paramount interest in pushing the line of goods as does the maker himself. Trade advertising represents a comparatively small fraction of the overhead expenses of any considerable factory. And if all British firms carried it on as extensively as their German and other rivals, the British optical instrument making industry would quickly attain that more prominent position in the export market which it deserves.

* * *

Motor Goggles.—On the basis of an interview with a well-known ophthalmic optician, Mr. H. R. Fairbanks, 'The Sentinel Transport News' has an article this month on the importance of providing drivers of commercial motors with goggles having worked lenses or glasses which are free from distortion. The advantage and almost necessity of properly glazed goggles for a motor driver is insisted on; but of course, the technical data involved here are familiar to our readers. A point well worth noting is that whereas opticians do a good trade already in eye protectors for motorists proper, they are often cut out by the general stores where mere drivers of commercial vehicles are concerned. If the owners of fleets of lorries, charabancs and so on, were approached in the right way, it would seem likely that they would realise the advantage of sending their drivers to be fitted with protectors which are both mechanically and optically of the most suitable construction to protect the eyes and give clear vision, thus doing something quite appreciable towards avoiding the liability to accidents.

The National Association of Opticians.

A meeting of the Council of the N.A.O. was held in Manchester on the 2nd inst. There were present Messrs. A. Hershberg, J. W. S. Green, J. W. Oberle, D. R. Jones, H. W. Daykin, C. Adams, and E. Moevius. A letter of apology for inability to attend was received from Mr. T. S. Baird.

The President, Mr. A. Hershberg, presided. After the confirmation of the minutes of the previous Council and Executive Meetings several letters from members (who complained of the unfair competition of the self-styled famous London eyesight specialists), were considered. As previously determined these members are informed, and all other members and non-members are informed, "That handbills are supplied by the Council at a small charge, and attractive wall posters are supplied free on condition the recipient pays the cost of posting them up."

The Hon. Treasurer's financial statement showed little change since the previous meeting, and was of the usual satisfactory nature.

The draft that had been drawn up of suggested terms, conditions, etc., of the N.A.O. new Examination Scheme was then considered, and after some discussion and minor alteration, it was decided to provide every member of the Council with a copy of it, prior to the next Council Meeting, when it would be further considered.

The applications for membership were then put before the meeting, and after due consideration the following were elected:—Messrs. D. S. Thomas, 17, Alworthy Avenue, Belfast; Herbert S. Taylor, 11, Bridlesmith Gate, Nottingham; Arthur C. Taylor, 11, Bridlesmith Gate, Nottingham; W. R. Bone, Bruce Road, Quetta, Baluchistan; and Edgar Phillips, 75, Leader Street, Sheffield.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

On the Best Form of Spectacle Lenses—XX.*

By A. WHITWELL, M.A., Fellow of the Optical Society.

Binocular Vision and the Field of View.

When a small near object is examined critically by the two naked eyes the optic axes $o\,m$, fig. 1, of the eyes converge and intersect in a point on the object. A small pencil of light from the object enters the pupil of each eye and is brought to a focus on the macula m as shown in fig. 1. When a lens, prism, or binocular instrument is placed in front of the eyes the pencils of light from the object in general suffer deviation by the lenses, prisms, etc., of the instrument and the object appears to be displaced. For example, if a prism p base outwards, as shown in fig. 2, be placed between the object o and the left eye, the object will appear to be at o' instead of at o.

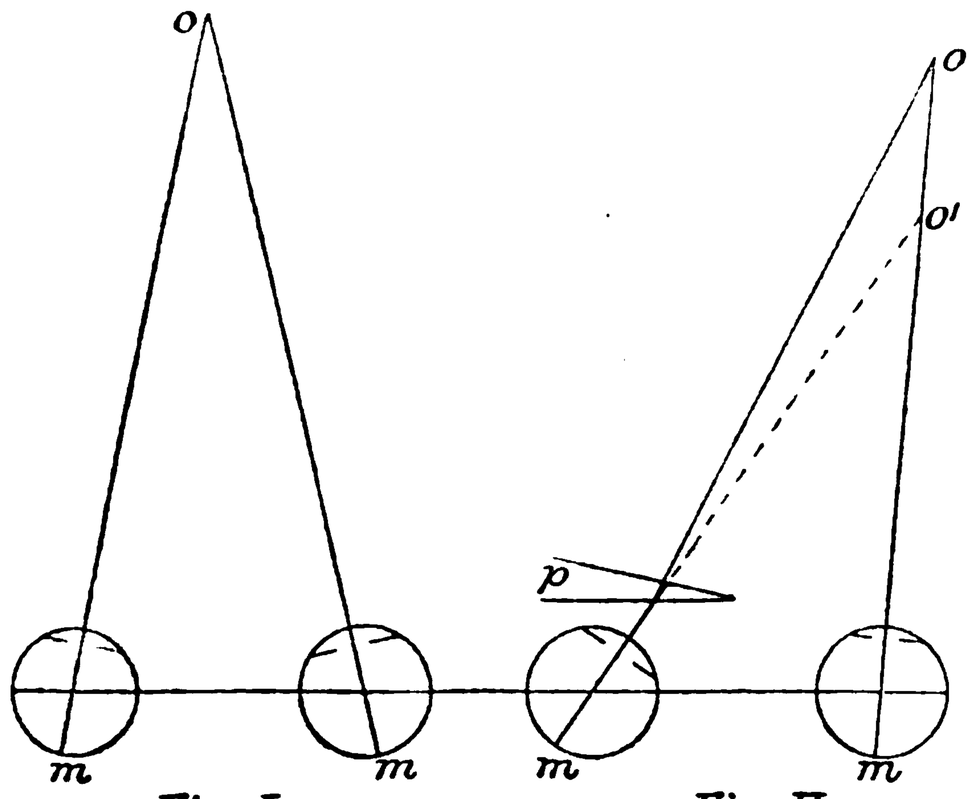


Fig. I.

Fig. II.

In the following article I propose to investigate the apparent change in the field of view when a pair of spectacle lenses of various different forms and set at different distances apart are used.

Method Used.

The method to be used is to trace a pair of rays from a point on the object through the two lenses and to find the intersection of the two emergent rays, or the two directions in which the two eyes see the object, always supposing that each emergent ray passes through the centre of rotation of the corresponding eye. The simplest and most obvious procedure would be to take points in a vertical object plane at right angles to the optic axes of the lenses and at a given distance from the eyes and to find the locus of the corresponding image points or the locus of the intersections of pairs of emergent rays. The difficulty in this procedure is that of finding the points of incidence on the lenses and the angles of inclination of the incident rays such that after refraction by the lenses the emergent rays will pass through the centres of rotation of the eyes. To get over this difficulty I suppose the *image* to be a plane, and I draw through each point in this plane two rays which pass through the centres of rotation of the eyes and trace these rays backwards through the lenses and find the corresponding incident rays. The intersection of each pair of such rays will give me a point on an object surface which when examined through the lenses will appear to be a plane. In reality, therefore, what is done is to find the principal curvatures of an object surface which will appear plane instead of assuming a plane object and finding the principal curvatures of the corresponding image surface.

Assuming the eyes to be looking horizontally straight forwards, fig. 3 represents a horizonal section through the centres of rotation c_r, c_l of the eyes and the centres of the lenses. The subscript letters r and l will always refer to the right and left eyes. The section of the object surface is marked a, b, and that of the image plane a', b'.

Notation.

In every case the power of the lenses was taken as 4D+.

$\mu = 1.53$ = index of refraction of the glass.

$d = 25$ mm. $= .025$ m. = distance of the centre of rotation of the eye from the last vertex of the lens.

$t = .003$ m. = axial thickness of the lenses.

*The other articles in this series were published in THE OPTICIAN on the following dates, May 2, July 25, 1913; Jan. 9, Jan. 23, Feb. 6, Feb. 20, April 3, April 10, May 29, July 3, Aug. 21, Sept. 4, Oct. 30, 1914: Dec. 15, 1916; Aug. 29, Oct. 3, Oct. 31, 1919; Jan. 9, Nov. 19, 1920; June 17, 1921.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Interpupillary distance = 60 mm.

Distance $b'o$ of the image plane from the line joining the centres of rotation of the eyes = 40 centimeters.

o is the origin of co-ordinates.

$o\ c_r\ c_l$ = axis of y; $ob'b$ = axis of x.

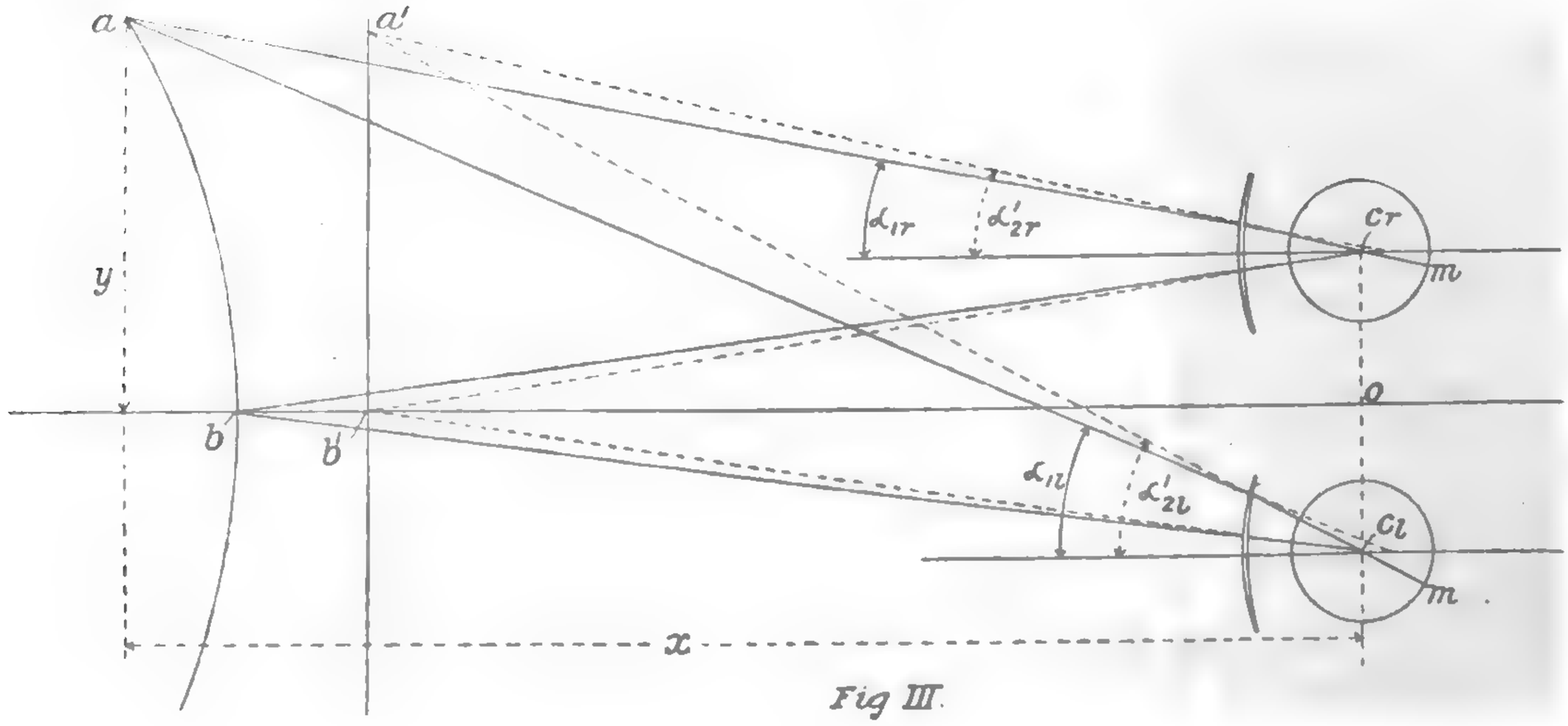


Fig III.

$o\ c_r = o\ c_l = 30$ mm. = ·03 m.

a_{1r} or a_{1l} = angle between a ray incident on the first surface of a lens and the optic axis of the lens.

$a_2'_r$ or $a_2'_l$ = angle between the corresponding emergent ray and the axis of the lens.

x_{1r} or x_{1l} the distance between the first vertex and the point in which a ray incident on the first surface cuts the axis of the lens.

$x_2'_r$ or $x_2'_l$ = 25 mm. = distance between the last vertex and the point where an emergent ray cuts the axis of the lens.

In fig. 3 rays $a'c_r$ and $a'c_l$ are drawn from a point a' in the image plane through the centres of rotation of the eyes. These rays are traced backwards from right to left and intersect at a which is the object point corresponding to the image point a'. Given the point a' and the angle $a_2'_r$ the value of a_{1r}, a_{1l}, x_{1r}, x_{1l} were found by trigonometrical computation in the usual way, four figure logarithms being used.

The equations to the rays incident on the right and left lenses respectively are

$$y = -x \tan a_{1r} + (x_1 - t - d)_r \tan a_{1r} + .03 \quad ...(1)$$

$$y = -x \tan a_{1l} + (x_1 - t - d)_l \tan a_{1l} + .03 \quad ...(2)$$

Where $x_1 - t - d$, = distance between the centre of rotation of the eye and the point where an incident ray cuts the axis.

Solving the equations (1) and (2), and substituting the values of x_{1r}, x_{1l}, a_{1r}, a_{1l} found by computation we get the co-ordinates of the point a.

Horizontal Curvature of Object Surface.

Fig. 4 shows the values of x and y plotted

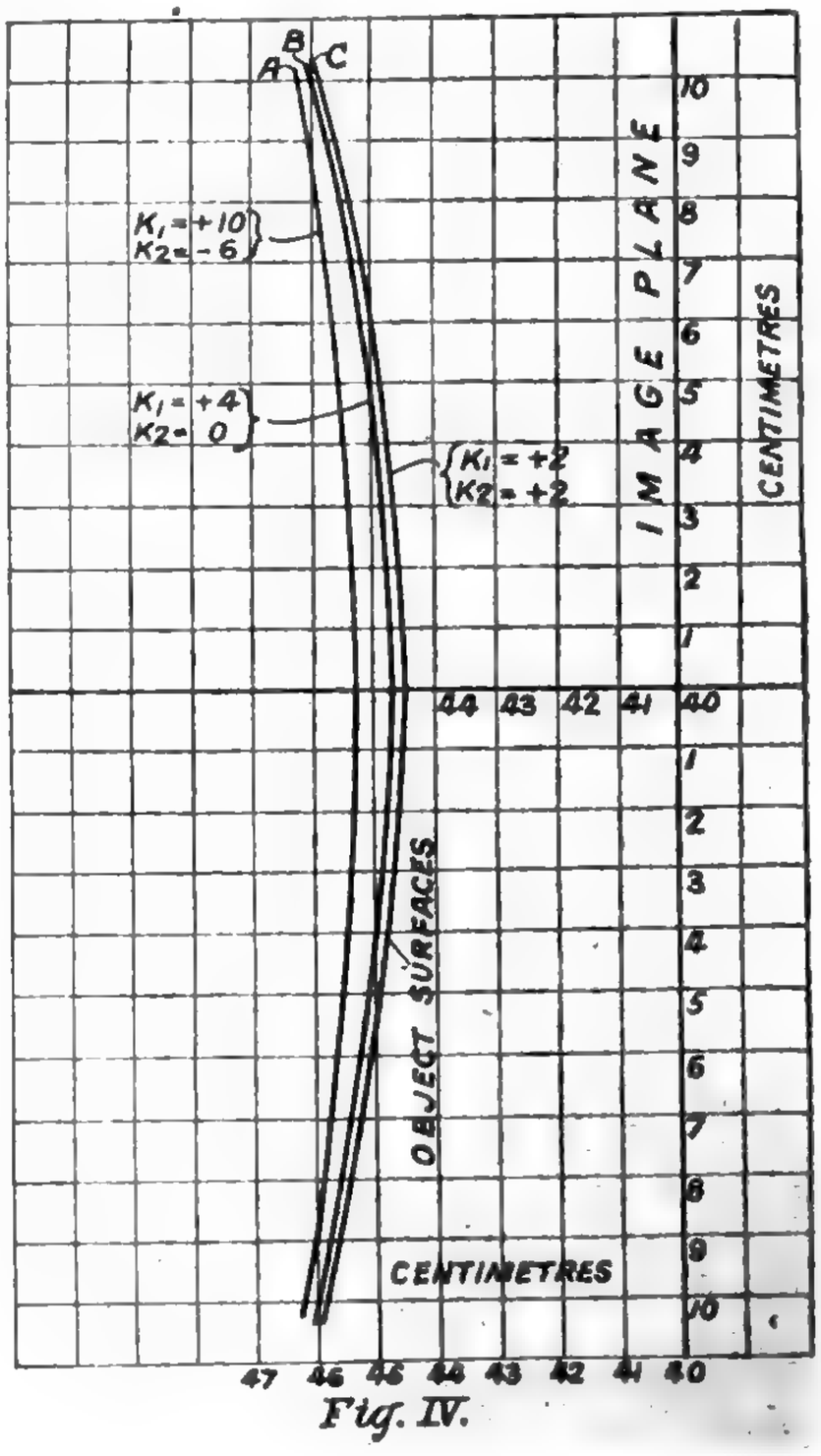
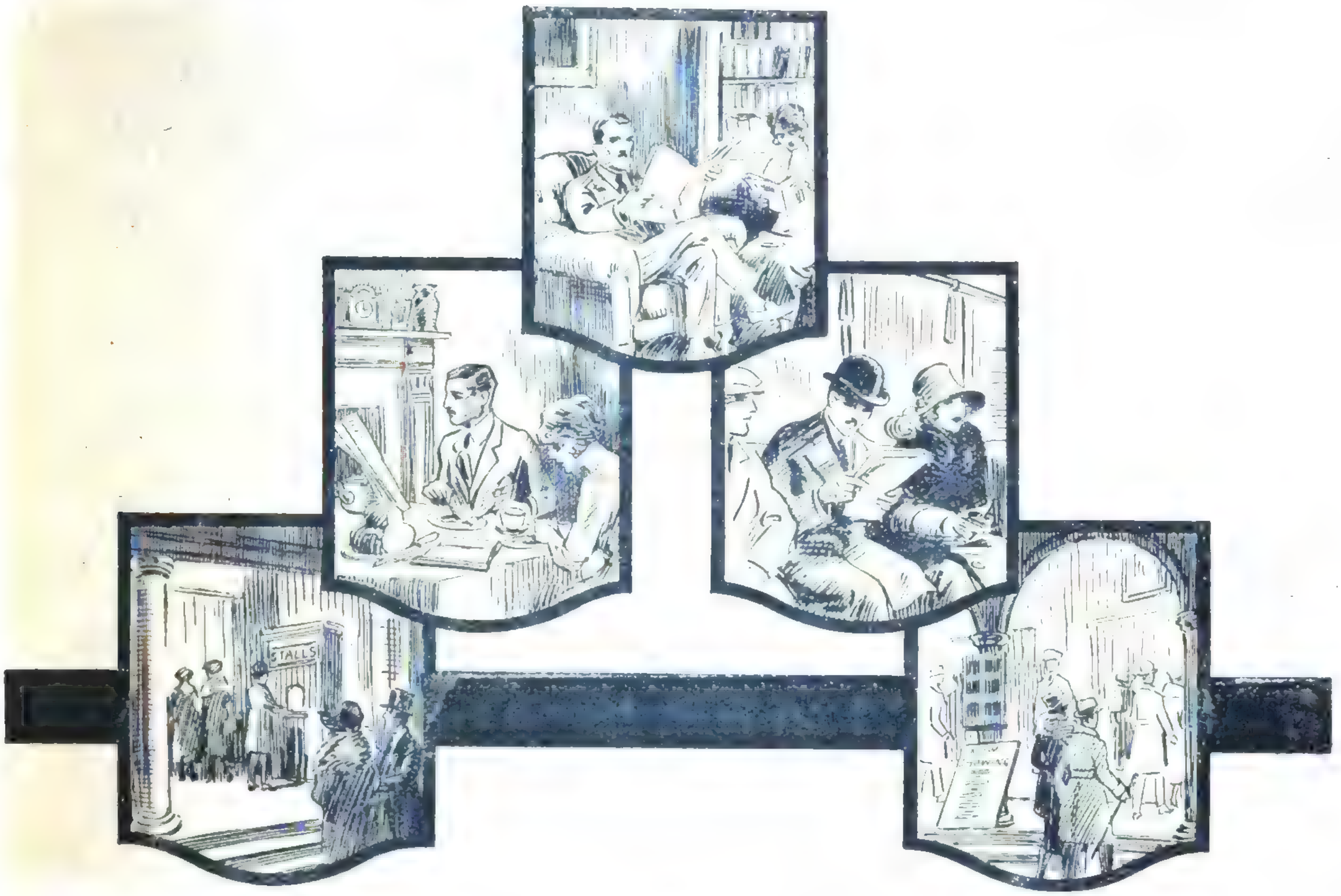


Fig. IV.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



The Easy Way to Persistent Publicity.

We can and will help you to tell all your own public that they must consult you about Chance's "Crookes" Glass.

For newspaper advertising, we have three special four-inch double column, and three special four-inch single column advertisements. They are illustrated, complete with telling "copy," wanting only your name and address and any extra message you want to insert. We will let you have the blocks—all or any of them—free if you will write.

For cinema, music-hall and theatre advertising, we will supply you free with one or more copies of a lantern slide which is very distinctive and telling in design and message. We will insert your name and address on this.

To use these two separate types of appeal is certain to bring you a wider clientele. Will you write us?

CHANCE BROS. & Co., Ltd.,

Glass Works,

Smethwick, Birmingham.



The late Sir Wm. Crookes O.M., F.R.S., to whose researches was largely due the evolution of Chance's "Crookes" Glass.

Chance's "CROOKES" Glass

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"WERTEX"

WILLMOTTS'

LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.

——— *F.S.M.C., F.I.O.*

Messrs. Willmotts Ltd.
Evesham. *London, 31-10-21.*

Dear Sirs,

Enclosed please find Cheque for September A/C.

Allow me to heartily congratulate you on "WERTEX" cases. I think you have succeeded in now giving us a case equal in every way to anything I have seen and at a lower price.

As long as you can supply me with a case similar to those of your first consignment you can rest assured that other makes will have no further consideration.

With all good wishes for the "WERTEX" future.

I am, Yours faithfully.

The above is one of many unsolicited testimonials. We asked this gentleman if we might use his letter & received the following reply:-

——— *F.S.M.C., F.I.O.*

Messrs. Willmotts Ltd.
Evesham. *London, 4-11-21.*

Dear Sir,

Thanks for yours of this morning.

By all means use the letter and if it brings you increased business I can only say you deserve it.

I am, Yours faithfully.

Samples may be had from your Dealer or direct from the Manufacturers—

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

ENGLAND.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

for three forms of lens. Curve A corresponds to a meniscus lens having the power of the first surface $\kappa_1 = \frac{\mu - 1}{r_1} = +10\text{D}$ and the power of the second surface $\kappa_2 = -\frac{\mu - 1}{r_2} = -6\text{D}$; curve B to a convexo-plane lens having $\kappa_1 = +4\text{D}$ and $\kappa_2 = o$; curve C to a double convex lens of $\kappa_1 = \kappa_2 = +2\text{D}$.

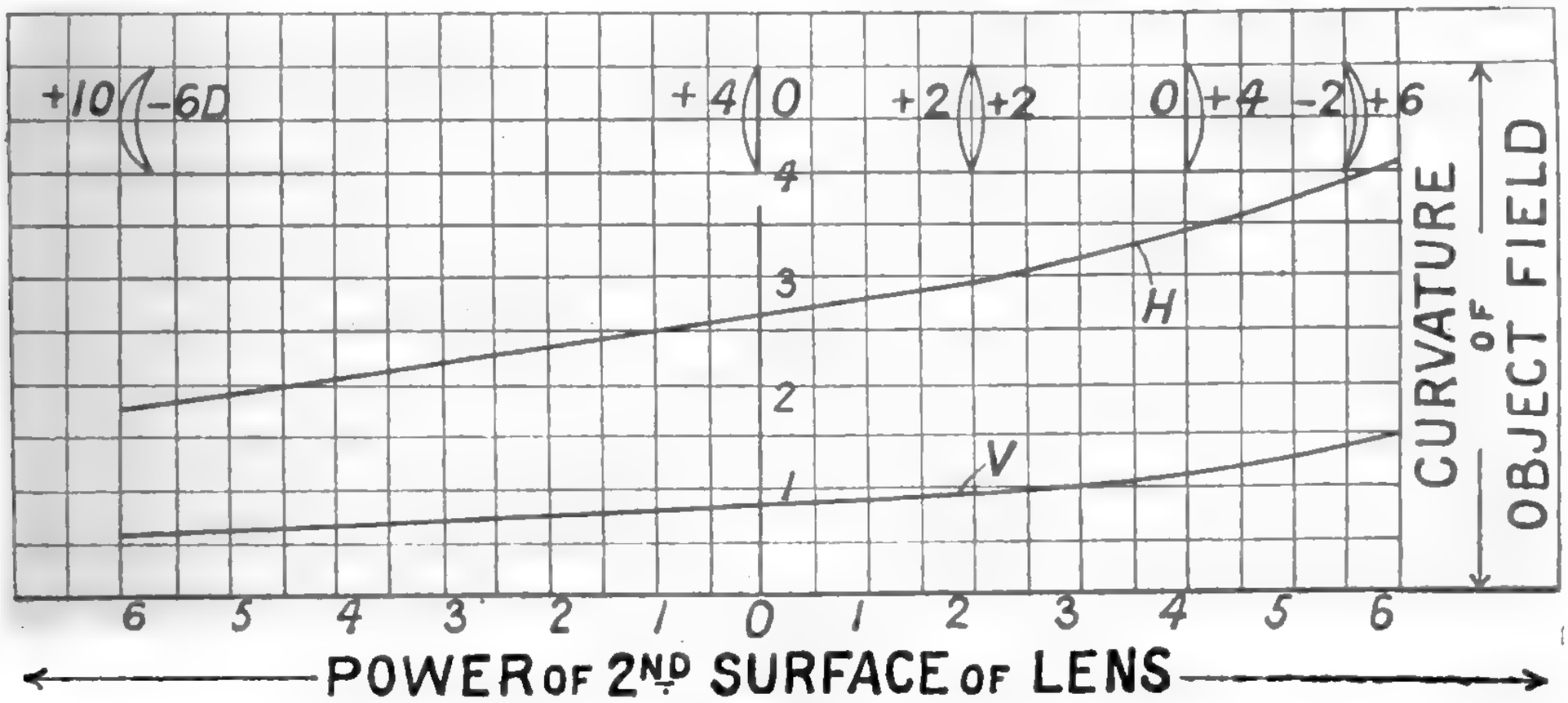


Fig. V.

The curvature of the object surface at the point where it cuts the axis of x was found from the relation

$$\frac{y^2}{2r} = x_a - x_b$$

Where r is the radius of curvature y and x_a the co-ordinates of a point on the object surface for which the angle $a_a'_r$ of the emergent ray is 10° and x_b the value of x corresponding to $y = o$. The variation of the horizontal curvature of the object surface when the lens is "bent" is shown by the curve H in fig. 5, in which the abscissæ are the powers of the second surface in diopters and the ordinates, the curvature in diopters. By "bending" the lens I mean, of course, that the powers of the two surfaces are varied whilst the power of the whole lens is kept constant. It will be seen that the lens has been bent from the form of a meniscus having a second surface of 6D+ to one having a second surface of 6D−

The curve shows that the curvature of the object surface which will appear plane to the eyes is greatest when the power of the second surface of the lens has its greatest positive value and least when the second surface has its greatest negative value. The field will appear flattest when the meniscus has its concave surface towards the eye.

It is legitimate to deduce that if the object surface be flattened, that is, if the point a (fig. 3) move to the right the corresponding image point a' will also move to the right so that when the object surface becomes plane the image surface will become concave. Whatever therefore be the form of the lens a plane object will appear to the eyes to be concave.

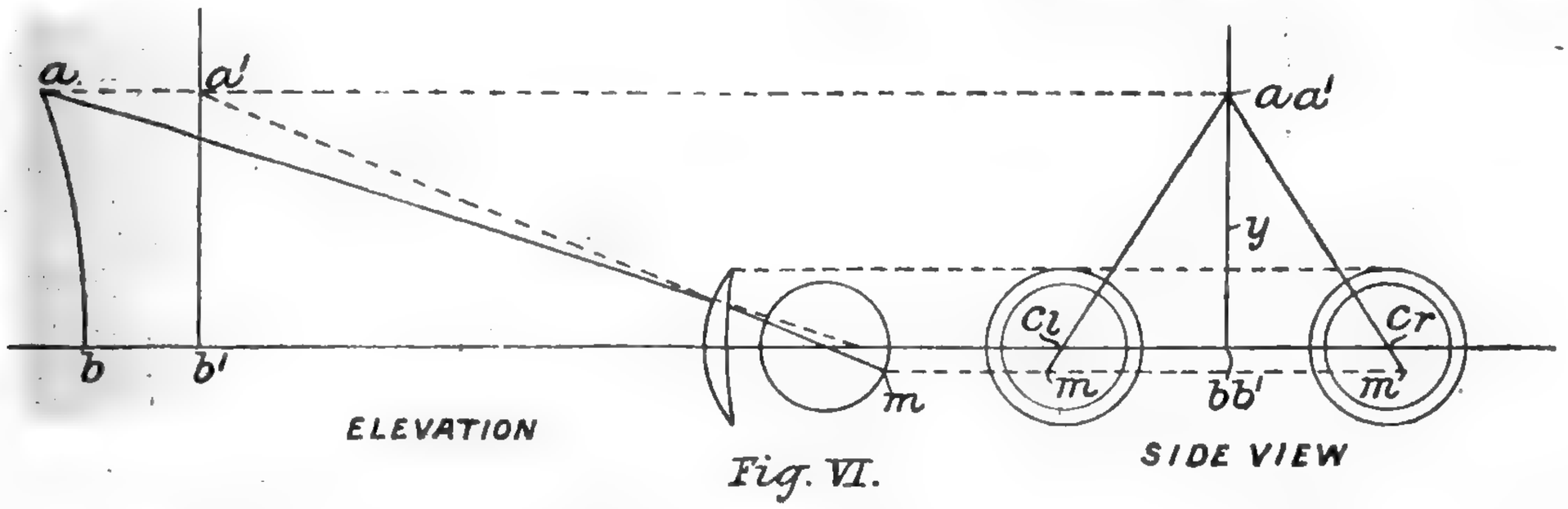


Fig. VI.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Vertical Curvature of Object Surface.

Up to now we have only dealt with the curvature of the object surface in a horizontal plane containing the optic axes of the lenses. We will now consider the curvature in the median plane, that is, a symmetrical vertical plane at right angles to the paper in fig. 3, and containing the axis of x.

Suppose the emergent ray $a'c_r$, fig. 3, and the corresponding incident ray to rotate about the axis of the right eye lens until the point a' comes into the median plane as shown in elevation and side view in fig. 6, and also suppose another ray $a'c_l$, equally inclined to the axis of the left lens, and its corresponding incident ray to rotate on the axis of the left lens till the point a' comes into the median plane. Everything being symmetrical the two points a' will coincide and if a line $a\ a'$ (fig. 6) be drawn parallel to the axis it will be seen readily that the two incident rays will intersect in the point a (fig. 6), in the median plane. Two rays coming from an object point a in the median plane will after refraction pass through the centres of rotation of the eyes and will appear to come from an image point a' in the median plane at the same height above the horizontal as the point a. As the point a' moves up and down the straight line $a'\ b'$ (fig. 6), the point a will trace out the curve $a\ b$ which is the section by the median plane of the object surface which will appear to the eyes as an image plane. To find the x and y of any point a in the curve $a\ b$, suppose a_2' to be the angle between the axis of one of the lenses and an emergent ray $a'c$, the subscript letters being dropped since the quantities refer to both lenses. The projection of the line $a'c$ on the image plane is $=.4 \tan a_2'$. The y of the point a is obtained from the relation.

$$y^2 + (.03)^2 = (.4 \tan a_2')^2.$$

as will readily be seen from the side view in fig. 6, remembering that the semi-pupillary distance is .03 meters and the distance of the image plane from the eyes is .4 meters.

The x of the point a is obtained from the relation.

$$.4 \tan a_2' = \{x - (x_1 - t - d)\} \tan a_1$$

where x_1, t, d, have the same meanings and values as before.

The curvature in the median plane at the point b fig. 6 is obtained in a similar manner to that in which the horizontal curvature was found. The variation of the vertical curvature of the object surface as the lens was bent is shown by curve V in fig. 5. The vertical curvature varies similarly to, but it is always less than, that of the horizontal curvature.

The object surface which will appear to the eyes to be plane is therefore convex towards the eyes but appears to be flatter in the vertical than in the horizontal meridian. If we assume the object to be plane the image will be concave but flatter in the vertical than in the horizontal meridian. If we suppose the sign of the curvature to follow the same convention as that of the surfaces of the lens then the curvature of the object surface which appears to the eyes plane will be negative and the curves H and V, (fig. 5) should be reversed about the axis of x. I did not think of this when I drew fig. 5.

TABLE I—HORIZONTAL SECTION OF OBJECT FIELD.

K = 4D + ; $a_2'_r = 10°.0'.0''$; $a_2'_l = 18°.4'.15''$

						$a_2'_r = 10°.0'.0''$		$a_2' = \pm 4°.17'.19''$	Curvature in Diopters	
κ_1	κ_2	a_{1r}	a_{1l}	x_{1r}	x_{1l}	x	y	$\frac{y=o}{x}$	H	V
+10	−6	8°.45'.44''	15°.47'.17''	.0312	.0314	−.4625	.1018	−.4532	−1.79	− .60
+ 7	−3	8°.49'.56''	15°.53'.7''	.0308	.0310	−.4610	.1021	−.4497	−2.17	− .70
+ 4	0	8°.53'.39''	15°.56'.56''	.0304	.0308	−.4606	.1025	−.4465	−2.68	− .80
+ 3	+1	8°.54'.24''	15°.56'.59''	.0304	.0307	−.4604	.1025	−.4457	−2.80	− .90
+ 2	+2	8°.55'.38''	15°.59'.1''	.0302	.0306	−.4605	.1027	−.4450	−2.94	− 95
+ 1	+3	8° 56'.48''	15°.59'.26''	.0300	.0306	−.4614	.1030	−.4439	−3.38	−1.03
0	+4	8°.57'.20''	16°.0'.10''	.0300	.0305	−.4614	.1030	−.4432	−3.43	−1.13
− 2	+6	8°.59'.7''	16°.0'.38''	.0297	.0303	−.4628	.1035	−.4413	−4.08	−1.52

Distance Between Object and Image Surfaces.

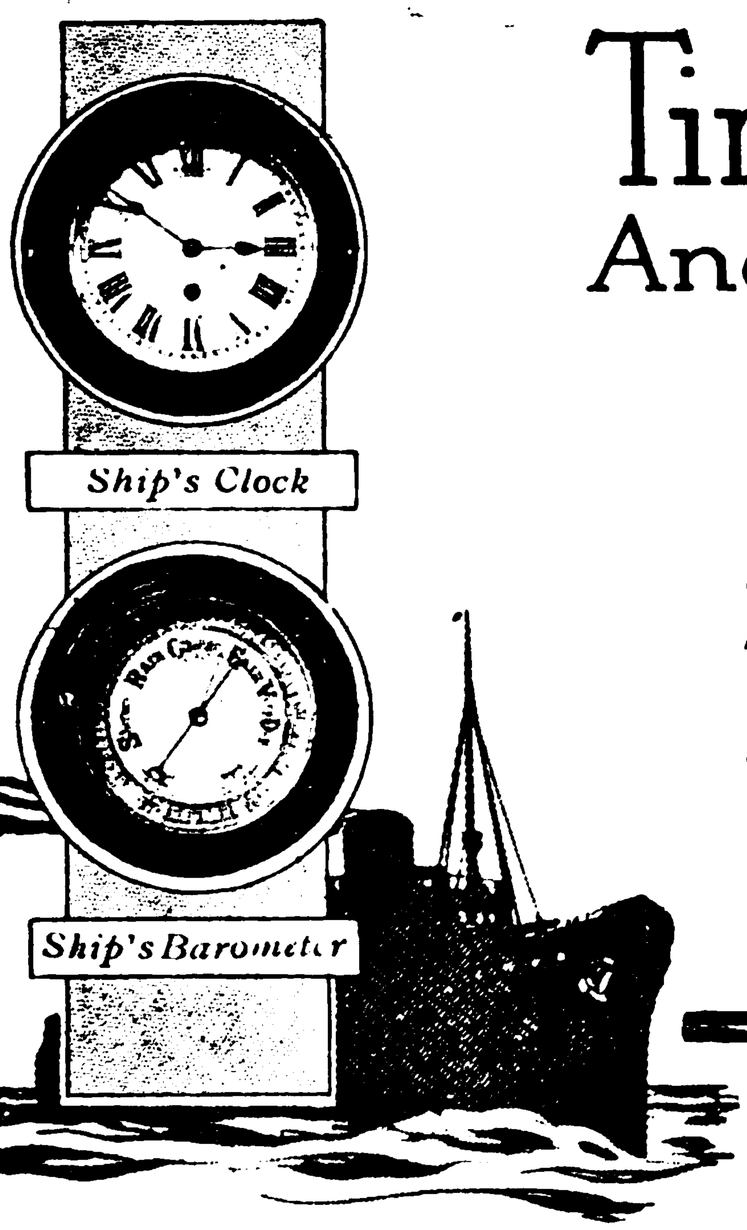
The distance along the axis of x between

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

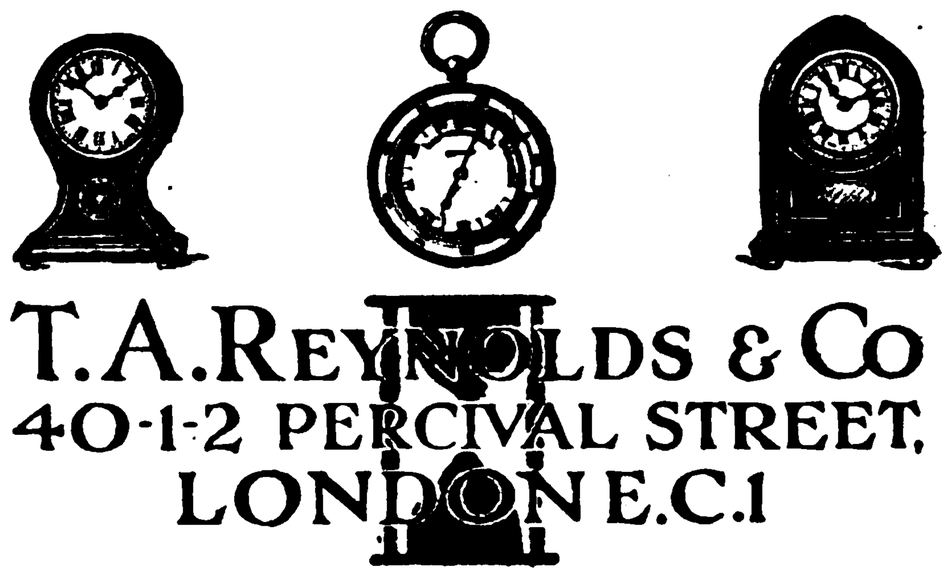
T. A. R. & Co.

"THE ALL BRITISH HOUSE."

Over 2,000 Designs in Aneroid Barometers.



Time and Tide
And Ship's Instruments



T.A.REYNOLDS & Co
40-1-2 PERCIVAL STREET,
LONDON E.C.1



Steam-pipe Thermometer *Hydrometer*

Telegrams—
"THERBAROME. LONDON."

Telephone—
339 CITY.

Showrooms and Offices at above address.

If you are a Retailer and need ORIGINAL LINES in Barometers, Clocks and Thermometers, write us, and although we will not supply you direct, we will put you in touch with the Nearest Wholesale House.

WHOLESALE AND SHIPPING TRADE ONLY.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

OPTICAL MANUFACTURERS LTD.,

(Incorporating Wheway Optical Co., Ltd.)

WAR TIME CONTRACTORS TO THE ARMY SPECTACLE DEPOT.

Manufacture for the Wholesale Trade:—

Gold and Gold Filled Spectacle and Astig Frames.

Gold and Gold Filled Rimless Spectacle and Finger Piece Mountings.

Gold and Gold Filled Monocles and Reading Glasses.

Solid Nickel Spectacle and Astig Frames.

Solid Nickel Pillar Frames and Folding Gauze Spectacles.

Steel Spectacle Frames.

Spectacle Sides and Jobbing Materials, in all Metals.

Extract from a letter just received by a large Wholesale House:

"We have sold Wheways spectacles for a long time now, and as they have given us such all round satisfaction we have every confidence in them and desire to stock all their products where possible."

All these Articles are of English Manufacture

Works at VYSE STREET and GEM BUILDINGS, HOCKLEY HILL, BIRMINGHAM.

London Office: 55, HATTON GARDEN, E.C.1.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

the object and image surfaces continually diminishes as the lens is bent from the meniscus form have $\kappa_2 = -6$D. to the meniscus form having $\kappa_2 = +6$D., in the first case it is 53 mm., see fig. 4, and in the second 41 mm.

The following table I. gives the values of the various quantities found by trigonometrical computation.

The Effect of Decentering the Lenses.

In order to find whether the horizontal curvature of the object field which appears to the eyes to be plane is affected by decentering the lenses. I took as an example a convexo-plane 4D.+ lens having $\kappa_1 = 4$ and $\kappa_2 = o$, and calculated the horizontal curvature when the distance between the centres of the lenses was 40 mm., 60 mm., and 80 mm., the interpupillary distance being 60 mm.. Table II. gives the particulars.

TABLE II

		Distance between centres of lenses.		
		40 mm	60 mm	80 mm
$a_2' = 10°.0'.0''$	x	−.2865	−.4606	−1.299
	y	.0647	.1025	.2875
	x	−.2877	−.4465	−1.339
	y	*o*	*o*	*o*
Horizontal Curvature		+.54D	−2.68D	+.89D
$a_2' = 10°.0'.0''$	a_{1r}	6.36.17	8.53.39	11.14.58
	a_{1l}	18.22.43	15.56.56	13.38.52
	x_{1r}	+.1274	+.0304	−.0263
	x_{1l}	−.0036	+.0308	+.0775

Distance between Centres of Lenses.

The convention of the sign of the curvature of the object surface is the same as that of the surfaces of the lenses, that is the curvature is positive when the surface is concave towards the eye and negative when it is convex towards the eye. In every case in which the lenses are properly centered the curvature of the object surface which will appear to the eyes to be plane is negative. Decentering both inwards and outwards has the effect of making the curvature positive that is to say a concave object will appear to the eyes to be plane and a plane object will appear convex. It follows that there must be two values of the decentration, one inwards and the other outwards which will make a plane object look plane to the eyes.

Conclusions.

Remembering that we have only considered the case of a 4D.+ lens and an image plane which is always 40 cm. from the eyes we have found.

1. Whatever the form of the lenses, so long as they are properly centered, an object which will appear to the eyes to be plane must be convex towards the eyes.

2. The horizontal curvature of this object surface will always be greater than the vertical curvature.

3. Both the horizontal and vertical curvatures of the object surface will be least when the lenses are of the meniscus form with the concave surface towards the eyes and greatest when the meniscus has its convex surface towards the eyes.

4. In order to give an image plane 40 cm. from the eyes the convex object surface will be nearest to the eyes or will most nearly approach the image plane when the properly centered lenses are of the meniscus form having their convex surfaces towards the eyes and farthest from the eyes when the lenses are of the meniscus form with the concave surfaces towards the eyes.

5. Through decentered convexo-plane lenses a concave object surface will appear to the eyes to be plane whether the decentering is inwards or outwards.

6. When the lenses are decentered inwards an image plane 40 cm. from the eyes is associated with a concave object surface nearer to the eyes.

7. When the lenses are decentered outwards an image plane is associated with a more distant concave object surface.

8. The cure for curvature of the field is decentering the lenses.

9. There is a critical amount of both inward and outward decentering which will cause the lenses to give a plane image of a plane object.

You cannot afford to do without THE OPTICIAN. As a manufacturer you need be acquainted with all published information bearing on design and on workshop technique. As a merchant you require to be kept informed of the latest novelties in spectacle-work and scientific instruments, so that you may be able to deal intelligently with all enquiries on these matters. As a sight-testing optician you want to know what is newest in connection with the refraction of the eye and the prescribing and fitting of spectacles. If you are interested in any way in the optical industry, you must keep abreast of its development by reading the technical and other trade news which is to be found only in THE OPTICIAN.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Radiations, Illumination and Colours.*

By Dr. MAX COQUE, B.Sc.

II.—ILLUMINATION.

It is obvious from what has been said before that the illumination of a surface that is not self-luminous is due to the fact that this surface receives light from some luminous body or luminous source. Reasoning as well as experiment show that with a given source of light, the illumination produced on a given surface varies in inverse proportion to the square of the distance separating the surface from the source. On the other hand, if different sources of light are successively placed at the same distance from a surface, it is generally found that the illumination of that surface is not the same in all cases. It follows that the sources differ from one another and we say that the difference in illumination is due to the fact that the sources emit various amounts of energy or various amounts of light. In other words, when several sources placed successively at the same distance from a given surface produce different degrees of illumination on that surface, it is because these sources have different illuminating powers.

The measurement of illuminating powers that is, the numerical comparison of the illuminating powers of a given source to that of a source, the power of which is adopted as unit or standard, is an important branch of applied optics, and many different instruments or photometers, the description of which is given in all text books on Light, have been devised with that view.

It must be clearly understood that in order that a numerical estimate of the illuminating power of a given source of light may be obtained, a unit must be selected the power of which is constant, and invariable under the conditions usually attending photometric work. Besides, the standard source should have the same illuminating powers when set up independently by different observers, provided that certain specified conditions be fulfilled. Few light standards comply with these conditions even approximately.

In their researches on the illuminating power of gas, Dumas and Boussingault had taken as unit the Carcel lamp, a lamp of stated dimensions burning colza oil at the rate of 42 grammes per hour, this amount being regulated by a clock work. As the power of this source is somewhat too high for some kinds of measurement secondary units have been selected, the candle in England, the bougie in France, etc. These various secondary units were not however determined with any degree of precision and therefore, the comparison of results obtained in different countries was without value. For instance, what is termed in this country the Standard Candle, is a Spermaceti candle, weighing six to the pound and burning 120 grains of spermaceti per hour. The illuminating power of a candle is far from being constant: it depends on the length and shape of the wick, so that snuffing produces a considerable variation; besides it also depends on the height of the flame, the temperature of the surrounding atmosphere and the amount of carbon dioxide and steam it contains. In fact the illuminating power of a candle may vary by as much as 20 per cent.

Now, as international agreement has been arrived at, and the scientific unit of illuminating power, the Violle unit, from the name of the French scientist who proposed it, is the illuminating power of a surface of melted platinum, 1 sq. cm., at the temperature of solidification. It is a well-known fact that when the temperature of a mass of water is lowered and reaches what is called the zero of the centigrade scale, the water begins to freeze and the temperature of the mixture of ice and liquid water remains at zero, so long as the whole mass is not converted into ice. Conversely if heat is applied to a mass of ice (which is necessarily at a temperature below 0° C.) until melting begins, it is easy to ascertain that the temperature of the mixture of water and ice remains at 0° C so long as there is some unmelted ice in it. The heat supplied to the ice does not cause any increase of temperature until the whole mass of ice is melted and merely serves to effect the molecular change.

The same facts apply to all solids which can be melted and to all liquids which can be solidified without undergoing chemical changes. Now, platinum is a metal the point of fusion of which is 1750° C. When a mass of platinum is brought to a temperature reaching the enormous value of more than 1750° C, it becomes liquid, and until the whole mass is melted, the mixture of melted and unmelted metal absorbs all the heat applied to it in ex-

*Continued from page 206.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

W.H.T.

Why Have Trouble

WITH YOUR PRESCRIPTION WORK

WHEN WE CAN GIVE YOU

ENTIRE SATISFACTION.

INCREASE YOUR SALES

And Earn the Reputation for

EFFICIENT AND PROMPT WORK

By the Facilities We Offer.

We have stocks of:—G.F. FRAMES & MOUNTINGS

in various qualities, also in NICKEL, STEEL & GOLD.

SHELLWARE and all requirements

for the up-to-date Optician.

WALTER H. THOMPSON

66 HATTON GARDEN, LONDON, E.C. 1.

Telegrams—LUNETTIER-SMITH, LONDON.

'Phone—HOLBORN 5713.

Digitized by Google

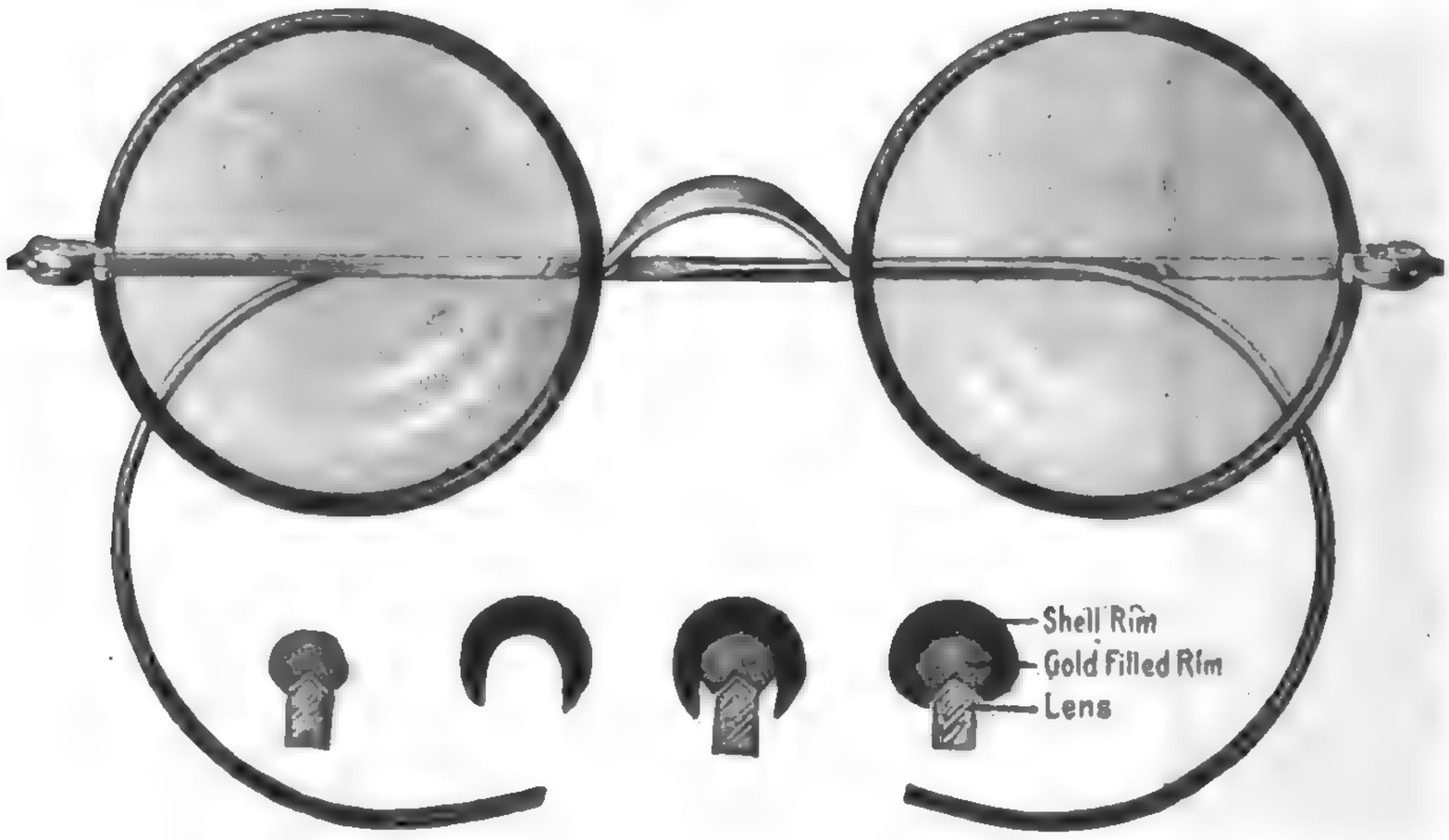
Original from THE OHIO STATE UNIVERSITY

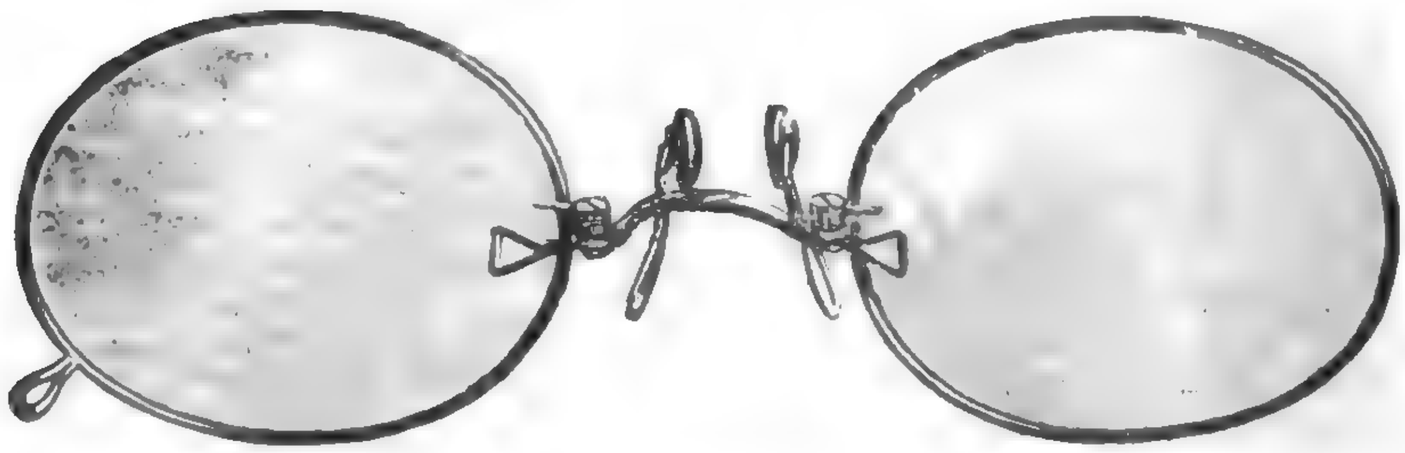


DUPAUL, YOUNG OPTICAL CO.,

SOUTHBRIDGE, MASS., U.S.A.

Guaranteed Quality and Best Finish Gold-Filled Eyeglass Frames, Astigs, Mountings and Materials.





To be obtained from all Wholesale Optical Houses.

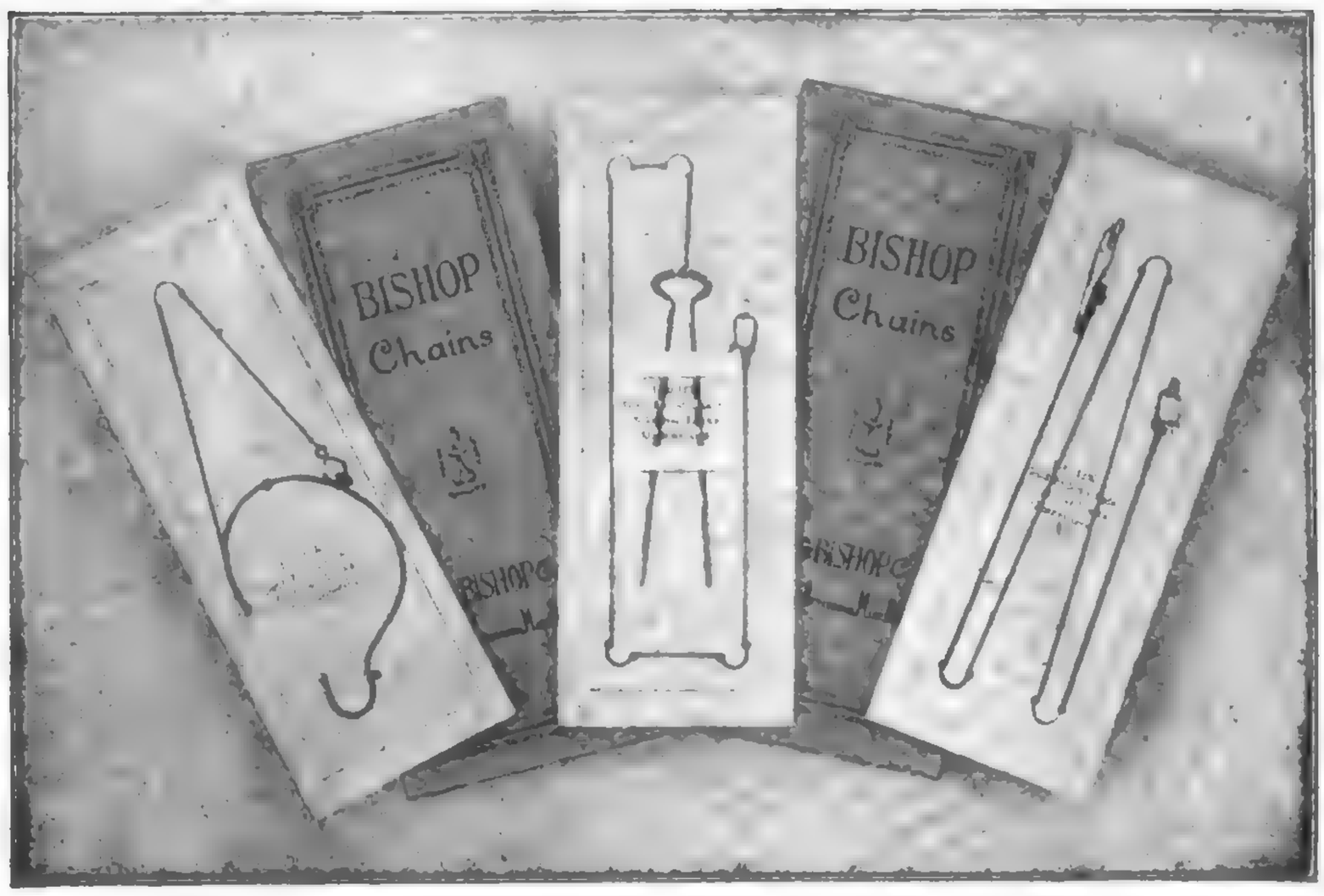
LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE BISHOP CO., INC.,
NORTH ATTLEBORO, MASS., U.S.A.



EYEGLASS CHAINS

In Gold and Gold Filled

GUARANTEED QUALITY, BEST WORKMANSHIP,
PERFECT COLOUR, SOLDERED LINKS.

ALSO

SILK EYEGLASS & MONOCLE RIBBONS

With Gold Filled snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. Telephone: CENTRAL 7241.

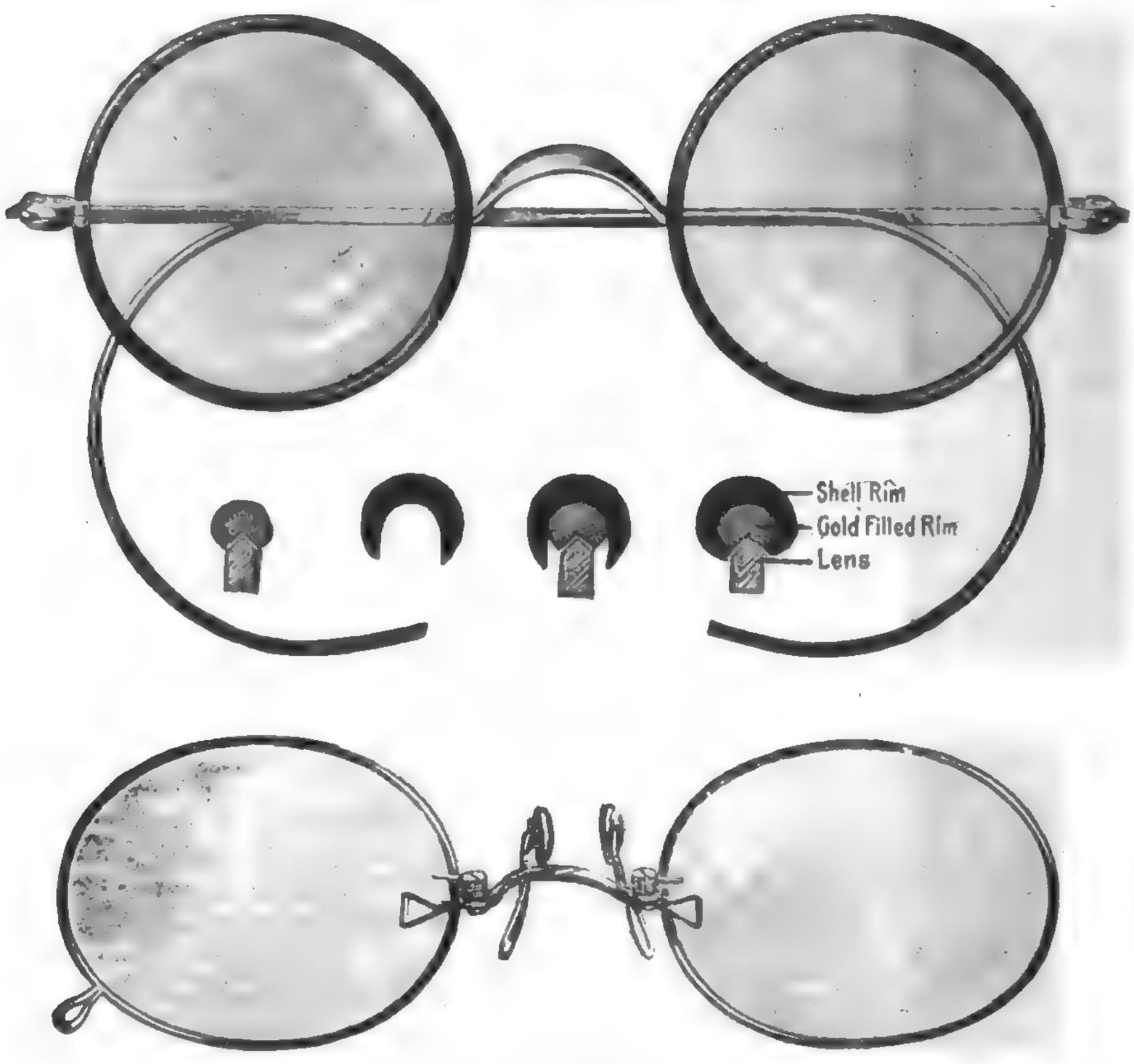
Digitized by Google Original from THE OHIO STATE UNIVERSITY



DUPAUL, YOUNG OPTICAL CO.,

SOUTHBRIDGE, MASS., U.S.A.

Guaranteed Quality and Best Finish Gold-Filled Eyeglass Frames, Astigs, Mountings and Materials.



To be obtained from all Wholesale Optical Houses.

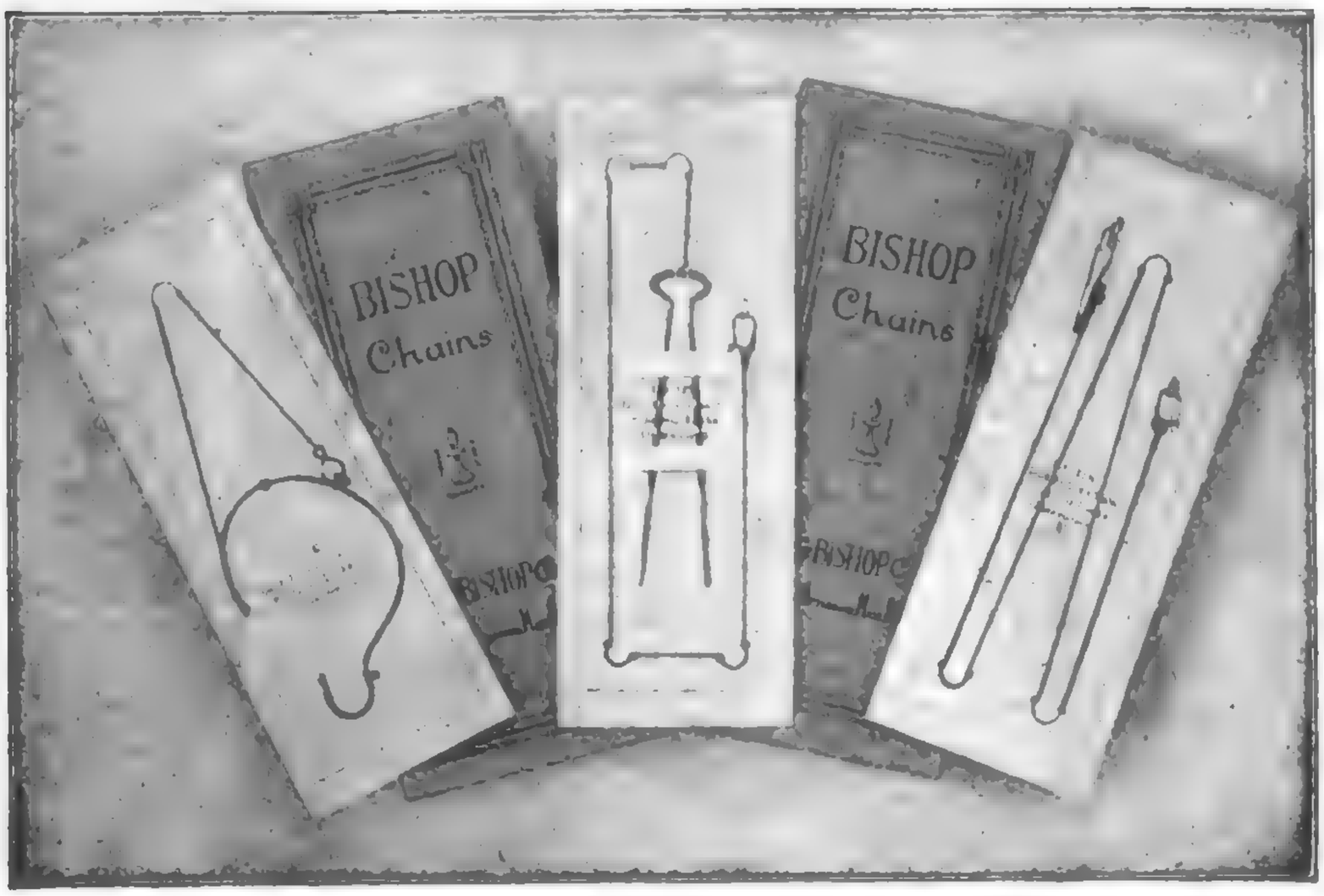
LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE BISHOP CO., INC.,
NORTH ATTLEBORO, MASS., U.S.A.



EYEGLASS CHAINS

In Gold and Gold Filled

GUARANTEED QUALITY, BEST WORKMANSHIP,
PERFECT COLOUR, SOLDERED LINKS.

ALSO

SILK EYEGLASS & MONOCLE RIBBONS

With Gold Filled snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

cess to that which is required to produce the exact temperature of fusion. When the melted platinum is allowed to cool and reaches the solidification point of 1750°, it remains at that temperature so long as there is some liquid left and liberates the heat that had been stored into it. This amount of liberated heat is sufficient to bring the surface of the metal to incandescence and experiment shows that the light thus produced by a given surface of platinum is constant in all circumstances.

The Violle Unit.

The cost of the apparatus and the difficulties attending the use of the Violle unit are necessarily very great and this standard of illuminating power is not practical outside a well fitted laboratory. A considerable mass of metal is needed to delay the process long enough to allow photometric observations to be made. It fulfils, for all that, the conditions required and has been adopted as the international unit by the Congress of Electricians in 1883. The comparison between the Violle unit and the Carcel lamp shows that the latter is equivalent to 0.48, *i.e.*, a little less than half the Violle.

Conversely, the Violle unit is practically equivalent to 2 Carcel, exactly 2.08. As we have pointed out before, the Carcel and still more so the Violle are somewhat too great in practice and secondary units have been adopted. Thus what was originally called in France the decimal bougie (decimal candle) is 1/10th of the Violle unit or 0.05 Violle. It has been accepted in most countries and is now known as the International bougie (or International Candle).

The original British Standard Candle or Parliamentary Candle of Spermaceli was not more scientific and hardly more accurate than the barleycorn of which three went to the inch. That candle weighing six to the pound, but the length and diameter of which were not specified, was intended to burn 120 grains of spermaceli per hour and was set up by the Metropolitan Gas Act, of 1860, as an official standard only for the purpose of testing London gas.

At the present moment, the standard used in practice in this country is the Pentane lamp devised in 1878 by Vernon Harcourt. It is a gas lamp burning a mixture of air and vapour of pentane. Liquid pentane is a definite compound of carbon and hydrogen answering to the formula $C_5 H_{12}$ and obtained by repeated distillations of the light American petroleum known as gasoline, at temperatures of 55°, 50° and 45° C. The mixture of air and pentane vapour is burnt in an Argand burner, the flow being regulated by a tap on the outlet and a valve on the air inlet of the pentane container. The present pattern of the Vernon Harcourt lamp is regarded as giving an illuminating power of 10 international candles.

In Germany, the official unit, termed the Heffner, is the illuminating power of the flame obtained by burning acetate of amyl in a lamp of specified dimensions. The Heffner is 9/10th of the international candle or which comes to the same the international candle is equivalent to 1.1 Heffner.

Variability of Glow Lamps.

When incandescent electric lamps were introduced as ordinary sources of light, it was thought that an electric bulb when the current and the voltage were maintained constant would give a fairly constant light at any rate over a limited period of time. It has been found impossible however, to construct a lamp so that its illuminating power for a given current and voltage shall be known beforehand. Further, the filament of a glow lamp changes with use and the inside of the bulb becomes blackened by carbon projected from the filament. Besides, the illuminating power of a glow lamp varies with the direction with respect to the plane of the filament in which observations are made.

The table given below shows the relative values of the various units of illuminating power, and may be useful for reference purposes.

As the practical measurement of illuminating powers is intimately connected with the measurement of illumination, we shall study the two subjects together at a later stage.

	International Candle.	Violle	Carcel Lamp	Petane Lamp	Heffner.
International Candle ...	1.0	0.05	0.104 roughly 0.1	0.1	1.1
Violle	20.0	1.0	2.08 roughly 2.0	2.0	18.0
Carcel Lamp	9.62 roughly 10	0.48 roughly 0.5	1.0	1.0	18.65
Pentane Lamp	10.0	0.5	1.0	1.0	9.0
Heffner	0.9	0.045	0.1	0.1	1.0

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



CHEMICO CLEERVIEW

EVERY SPECTACLE USER NEEDS IT ——

is the invention of a Spectacle user who realized that sight might be considerably improved by the

SCIENTIFIC CLEANSING

and polishing of the lenses of

SPECTACLES, EYEGLASSES, Etc.

IT RETAILS AT ONE SHILLING.

Polishing the lenses by the usual method with the pocket handkerchief does not give that clear view and power of which the glasses are capable.

EVERY OPTICIAN SHOULD STOCK IT ——

In the atmosphere in which we live (both indoors and outdoors) are greasy, tarry products which deposit themselves on the glasses and **"BLUR"** the sight.

SAMPLE SENT FREE ON REQUEST

These products are not soluble in water and are not removed by the handkerchief.

BIG BUSINESS IS BEING DONE ——

CHEMICO CLEERVIEW

is a perfect cleanser and polisher and has also the peculiar property of preventing fogging and steaming.

BUT BIGGER BUSINESS IS COMING—

WRITE FOR LITERATURE AND TRADE TERMS.

THE COUNTY CHEMICAL Co., Ltd., Chemico Works, Birmingham.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Don't tolerate it!!

If in your opinion your work is not being returned as fast as might be —just try the Willesden Way.

• • • •

Address your next box of jobbing to W.O.W.—see what they can do.

• • • •

You have the Willesden guarantee for quality—all the time, and the difference in price is in your favour.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY:
DUDDEN HILL LANE, N.W.10

TURNERY WORK
IN
EBONITE

Small turnery work of all kinds undertaken. Rod and Sheet supplied in any quantity, cut to order. **Enquiries Solicited.**

BURGE, WARREN & RIDGLEY LTD.
91 & 92, GT. SAFFRON HILL, LONDON, E.C.1

MANY SUCCESSES IN THE EXAMINATIONS!
Your Opportunity to
QUALIFY IN OPTICS

PRACTICAL WORK. Students taking the Course may receive personal tuition in the practical work AT ANY TIME DURING THE COURSE.

Expert Tuition by Correspondence for the SIGHT-TESTING DIPLOMAS of the Worshipful Company of Spectacle Makers (F.S.M.C.), or the British Optical Association (D.B.O.A.).

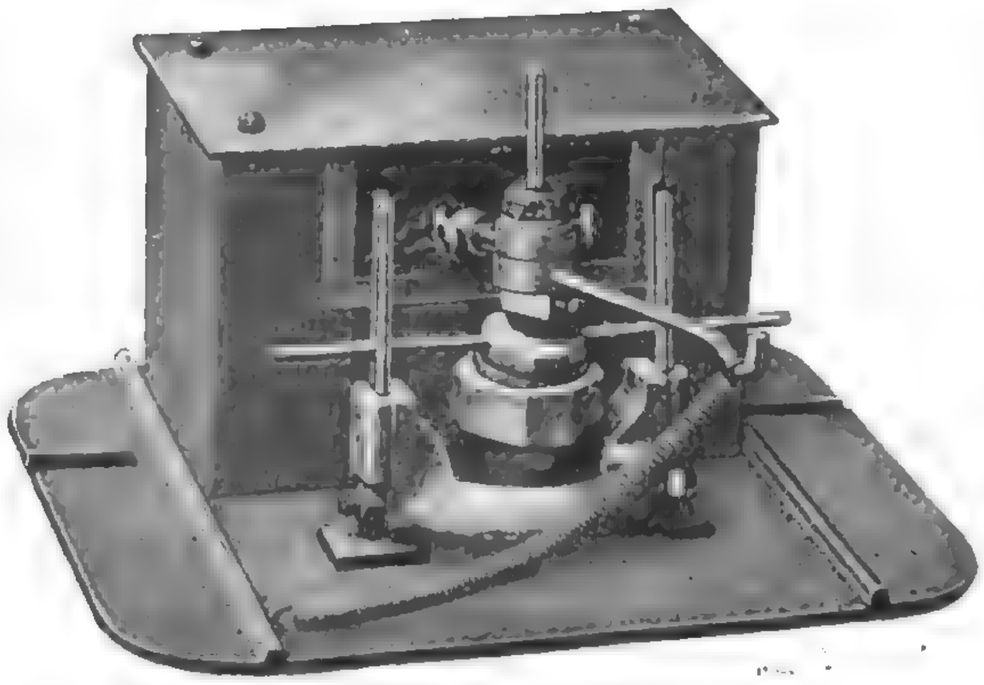
Write for full particulars—
C. A. SCURR, M.P.S., F.S.M.C., F.I.O., etc.
64, High Street - - - - BARNET.

"SOMCO"
AUTO-SURFACING MACHINE.

PATENTED IN
GREAT BRITAIN
U.S.A.
FRANCE
GERMANY.

LONDON
MADE.

Ask for Quotations.



Requires Only 1/6 H.P.

TOOLS
GAUGES
SURFACING
SHOP
EQUIPMENT
OPTICAL
MACHINERY &
INSTRUMENT
REPAIRS.

SURGICAL & OPTICAL MFG., Co.,
22, Union Road,
Clapham, London, S.W. 4

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Now that we know the illuminating power of a given source of light can be expressed numerically in terms of a definite unit, we have to investigate the subject of illumination and measurement of illumination.

[To be continued.]

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

To the Editor of "The Optician" and Friends on this side of the Atlantic.

Sir,—I am writing you this note on the eve of my departure from London for my home in Massachusetts for the purpose of expressing to the many friends in England, Scotland and various parts of the Continent, my deep appreciation of the delightful visit I have had.

It has been delightful, not only because of the many places and scenes of magnificence which I have seen, but chiefly because of the men and women I have met, face to face, who are interested in kindred lines.

It has been my privilege to deliver the Thomas Young Oration, the Dr. Ettles Memorial Lecture, a Glasgow lecture, an address at Manchester, and an address before the British Optical Association. The audiences have been most appreciative and attentive, and any man could well be proud to have such audiences.

And the visit has been delightful and profitable because of the many personal visits to oculists, optometrists and opticians, and because of the many-phased discussions which have arisen. All of these have given me renewed energy and determination, and have given me greater faith in the future of optical and ophthalmological practices.

As I close this note of appreciation and thanks for the many courtesies and kindnesses extended to me, I feel that this visit has been to me personally one of the great events in my life, and that, as I said in public on one occasion, "I should not have missed it for anything in the world"—So I am going back home to Southbridge, and as I again step into the offices and factories of the American Optical Company, I shall do so with the feeling that you have done me great good. I shall think of all of you by day and dream of you by night, and my thinking and dreaming will always carry with it a *simile* and a memory of good friends across the sea.

May all the good things imaginable, both in body and soul, be yours.

Cordially,

CHARLES SHEARD.

39, Hatton Garden, E.C.1.

November 21st, 1921.

The Spectaclemakers Company.

Sir,—With reference to the letter of Mr. J. N. Arnold, which appeared in your last issue, I beg to say that the examination fee and annual subscription of the Spectaclemakers Company have not been increased, but remain the same as they have been for many years past. The examination fee is Six Guineas and the annual subscription is Four Shillings.

I shall be much obliged if you will insert this letter in the correspondence column of your next issue.

LIONEL LAURANCE.

Official Instructor to the Spectaclemakers Company.

2, Guilford Place, London, W.C.1.

Sir,—With reference to the letter in your issue of the 18th inst., under the heading of "Fees for Sight-Testing."

I was not aware that either the fees for examination or the yearly subscription for the Spectaclemakers Company had been increased from what they have been for many years, and my inquiries have confirmed this.

As the increased fees apparently form the basis of your correspondent's argument, it is rather a pity that he did not trouble to make any inquiries before writing his letter.

M. HEILBRON.

136, Elborough Street, S.W.18.

Early Sight Testing.

Sir,—The record furnished by Mr. G. Braham (*The Optician*, Nov. 4th), is certainly interesting. He has not yet, however, replied to "Notrom's" request, viz., to give your readers particulars of the examination he passed in 1879. I have been connected with the trade a good many years, but do not know of such an early examination as that.

OPTICUS.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

P. D. for Near Vision.

Mr. D. F. McDonald writes in the New York 'Optical Journal':—The following subjective method of ascertaining the correct P.D. for near work—which, so far as I know, is original with me—is, in my estimation, an excellent one for the majority of patients. Place the pin hole disc in one cell of the trial frame and the stenopaic slit in the other cell. Adjust them as nearly as possible at the distance from the eyes that the glasses are to be worn, the slit to be vertical. Now place some light coloured object such as a newspaper in the hands of the patient, and have him hold this at the proper working distance from his eyes. While he is looking at the paper, adjust the pin hole and slit so that he will see the light vertical line with the round spot superimposed. This will give the exact P.D. for this distance.

Inefficiency Due to Imperfect Sight.

The Eye Sight Conservation Council of America has recently made public the results of a careful examination of 10,000 industrial and commercial workers active in their work and supposedly in good condition, of whom 53 per cent. showed defective vision uncorrected. It was found that many employees are accused of inefficiency and carelessness when it is entirely a matter of imperfect vision. The report urges that just as it is necessary for school children to be examined, so every individual between the ages of twenty-one and thirty-nine years should have the ocular state ascertained, as was done in the case of the army recruits.

Von Helmholtz to be Translated into English.

The Optical Society of America, at its sixth annual convention, held at Rochester, New York, adopted a resolution providing for the appointment of a committee to translate the work of Dr. Hermann von Helmholtz, 'Physiological Optics' at the centenary of the author's birth. This book has been translated into French but not into English and it was the sense of the meeting that its translation into English would provide an aid which would prove invaluable to members of the society as well as all men interested in the advancement of optical science. In accordance with the resolution, a committee was appointed, consisting of Prof. J. P. C. Southall and Messrs. Irwin G. Priest and Adolph Lomb, of that city, to arrange for the translation.

Trade Topics.

Recently (says an Australian newspaper) Melbourne University authorities prescribed as the official make of microscope, the German Leitz, sold at £30, notwithstanding that there are a number of at least equally good English makes on the market at prices from five to ten per cent. cheaper. No other makes will be approved by the authorities. Over a hundred Leitz microscopes have been purchased by students, and at a wholesale cost of £20. This means that £2,000 has gone out of the country to Germany.

The Bondwell F.C. (C. W. Dixey & Son) played a scrambling game at North Finchley on Saturday, November 19th, which ended in a draw of two goals each. The Bondwell mostly overplayed the home side, but the slippery ground made shooting difficult. The "Bees" were frequently penalised for off-side. Result: Bondwell, 2; G.P.O. (Electric Light & Power Dept.), 2. On Saturday, November 26th, the Bondwell F.C. oppose St. Andrew's Institute (Cricklewood) F.C., at home, Lea Bridge Road. Supporters are cordially invited. Meet at Radley's Boat House.

According to the 'Japan Chronicle' (Kobe), German machinery is steadily regaining its popularity in Japan and is arriving in increasing quantities. There were doubts, soon after the termination of the war, whether German manufacturers could make as good machinery as before, and not very many orders were placed except for special goods peculiar to Germany. Subsequent trial orders, however, proved that the machinery is excellent. "What is still better, German goods are cheap, being lower by some 30 per cent. than British and American goods." Orders for scientific and chemical ware used in laboratories, it is said, are being given mainly to Germany.

New Company.

Alfred Bond, Ltd.—Private Company.—Capital £16,000 in £1 shares. To take over the business carried on by A. Bond, M.P.S., at 15, Bank Street, and 44, Fore Street, Newquay, and to carry on the business of chemists, opticians, etc. The first directors are:—A. Bond, 15, Bank Street, Newquay, C. E. Whitford, Rosemellyn, St. Columb, M. Gatley, Fore Street, St. Columb, and 2 others to be nominated by them after allotment. Qualification, 250 shares. Remuneration: £150 per annum divided between them. Solicitor: F. Carpmael, Newquay, Cornwall.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

OPTICAL PRODUCTS COY.,

Phone: MID. 778.
Telegrams: ORBIMOUNT.

WORCESTER STREET, BIRMINGHAM.

OPERA GLASSES
FIELD GLASSES
LORGNETTES

By all Leading Makers in Every Pattern.

Lemaire, Hunalex, etc.

Send for Special Prices for Xmas Trade.

DO NOT MISS THIS OPPORTUNITY.

The Prefix is alright but what really counts is

THE SUFFIX

Crookes glass dates back to say 1913, and made by anyone is original and genuine, but it is important to remember that applies only to Sir Wm. Crookes A and B Glass. Since that date much water has flowed under London Bridge and Sir William only ceased his labours when he brought out his *Ultimate* Glass—the result of his long years of research. The only genuine Crookes Ultimate is made by—

SIR WILLIAM CROOKES ULTIMATE ANTI-GLARE GLASS CO., LTD.,

30, WIGMORE STREET, LONDON, W.

REMEMBER THE SUFFIX—ULTIMATE.

TRY KIRK BROTHERS WHOLESALE & MANUFACTURING OPTICIANS FOR

OPTICAL REQUIREMENTS OF EVERY DESCRIPTION.

SPECTACLES and EYEGLASS FRAMES
RIMLESS MOUNTINGS
REPAIR MATERIAL
EYEGLASS CHAINS

TORTOISESHELL, HORN, XYLO and SHELLITE FRAMES
LORGNETTES
CASES
MOTOR GOGGLES, etc.

UNCUT LENSES WHITE or CHANCE'S CROOKES GLASS

SPHERES, BI or PERIS
ROUGH CYLINDERS
PLANO CYLINDERS
SPHERO CYLINDERS

CEMENT SEGMENTS
MENISCUS
TORICS
ROUGH TORICS, etc.

OUR RX DEPARTMENT IS UNEQUALLED FOR PROMPTNESS & ACCURACY.

Telephone: HOLBORN 1620 (Private Exchange).

KIRK BROTHERS WHOLESALE & MANUFACTURING OPTICIANS

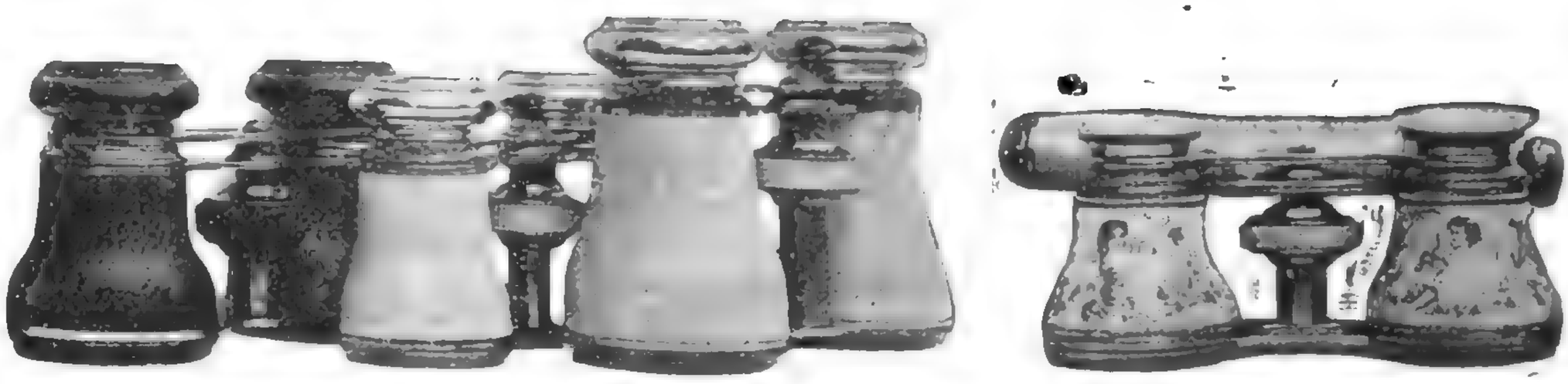
Telegrams: KIRBROREX, HOLB. LONDON.

36, GRAY'S INN ROAD, LONDON, W.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

SPECIAL NOTICE.



We hold Large Stocks of OPERA GLASSES in ordinary and Handle patterns, with Morocco Covered, Pearl or Enamel Bodies.

As these were bought before the Key Industries Bill became Law and when the Rate of Exchange was greatly in our favour, we can offer our present stock at exceptionally Low Prices.

We also hold large stocks of FIELD GLASSES, TELESCOPES, MICROSCOPES, PRISM BINOCULARS, etc., etc., which are Splendid Value.

Full particulars and prices will be sent on application.

JOHN BAIRD, **"HERALD" OPTICAL WORKS,**
Manufacturing Optician, **68 & 70, MITCHELL ST., GLASGOW.**
Telegrams: "SPECTACLES, GLASGOW." ***Telephone: CENTRAL 541.***

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Shur-on Glasses

The Shur-on Reputation

Shur-on eyeglasses and spectacles are preferred by thinking people because they realise that an organization which has, for upwards of half a century, rigidly adhered to a manufacturing policy based on "Quality Beyond Question" *must* turn out a product which ensures their getting a brimming measure of honest value, as measured in terms of dependability, comfort, becomingness and wearability.

If your wholesaler cannot supply you with Shur-on products, send us his name.

Shur-on Optical Co.,

Rochester, N.Y., U.S.A.

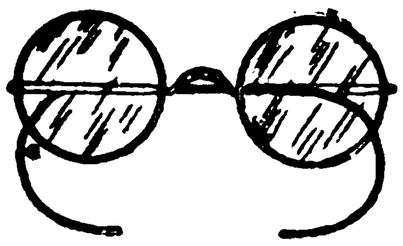


A Popular Shur-on.

Noted for its becomingness and serviceability. A good frame which will be a good-will builder for you. The shoes are unordinarily stiff; the straps are reinforced for added rigidity and strength; shanks are specially processed for extra toughness; joints are all electrically soldered.

Quality Beyond Question Since 1864

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



OPTICAL BLOCKS

To illustrate all features of Optical Service. Write for Lists.

CHEMISTS' DESIGN SERVICE,
12, Humberstone Gate, LEICESTER.

DOING YOUR OWN EDGING?
Write us for
UNCUT TORICS.
Remarkably Low Prices.
APEX OPTICAL Co., Kidderminster.

PERCY S. DE SAULLES.
Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES.
Micro Cover Glasses, Glass Cells and Cavity Slips, etc.
The Platts, Amblecote, Stourbridge.

C. BAKER 244 HIGH HOLBORN LONDON
Estab. 1765
YOUR REQUIREMENTS however exacting, will probably be met from our Second-hand Stock
WRITE TO-DAY FOR LIST, POST FREE.

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
C. G. DYMOND, M.I.Mech.E., F.I.C.P.A
W. P. THOMPSON & CO.,
12, CHURCH STREET, LIVERPOOL.
Chartered Patent Agents.
H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and AERONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
ESTABLISHED 1878 TELEPHONE CITY 419

BRITISH OPTICAL INSTITUTE, LTD.,
(College of Optics).
Complete Training for the Sight-Testing Optician.
Supplementary to the usual Daily Classes and Correspondence Courses, a series of Evening Classes is held, for those desirous of preparing themselves for any of the Optical Examinations.
A Course of Weekly Evening Lectures, and Demonstrations, for candidates for the F.B.O.A. Examination, and for post-graduates, has also been arranged.
Clinical Classes.
are held on two afternoons a week, and give Students the special advantage of meeting actual cases, generally of particular interest.
The whole work of the Institute is carried out under the supervision of the Principal, assisted by Mr. Geo. Colebrook, F.B.O.A., F.S.M.C., (Master's Prizeman).
For full particulars apply to:—The Principal, Dr. MAX COGUE, B.Sc., Fern Lodge, 20a, Grove Road, Brixton, S.W.9
Telephone: Brixton 677.

Scientific Instrument Makers.
MICROSCOPES of all kinds manufactured at our own works.
REPAIRS to Prismatic and other Binoculars etc., promptly executed.
H. H. SHARLAND (H. KEMP), 9 & 10, THAVIES' INN, HOLBORN CIRCUS, LONDON, E.C. Tel.: Holborn 4840. Established 1868.
Every Description of Ophthalmic Supplies.
All Requirements of the up-to-date Sight Testing Optician.
Good Special Lines at keenly Competitive Prices.

F. BARKER & SON, LTD.
SUNDIAL HOUSE,
12, Clerkenwell Road, LONDON, E.C. 1
Registered Trade Mark LONDON
Estab. 1848
MANUFACTURERS OF ALL CLASSES OF
SCIENTIFIC AND OPTICAL GOODS.
MANUFACTURERS OF
Aneroid Barometers, Compasses, Drawing, Mining, Surveying & Scientific Instruments of Every Description.
Illustrated and Descriptive Catalogue Post Free to any part of the World. Illustrated Booklet upon Sundials, Barometers and Compasses, Post Free. LISTS FREE.
Correspondence Invited. Bankers' and Trade References.
CLINICAL THERMOMETERS A SPECIALITY

Worshipful Company of Spectaclemakers.
Tuition for the Company's Examinations in Optics and Sight Testing at
THE SCHOOL OF OPTICS Ltd.
2, GUILFORD PLACE, LONDON, W.C. 1
Particulars on application.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

STRENGTH

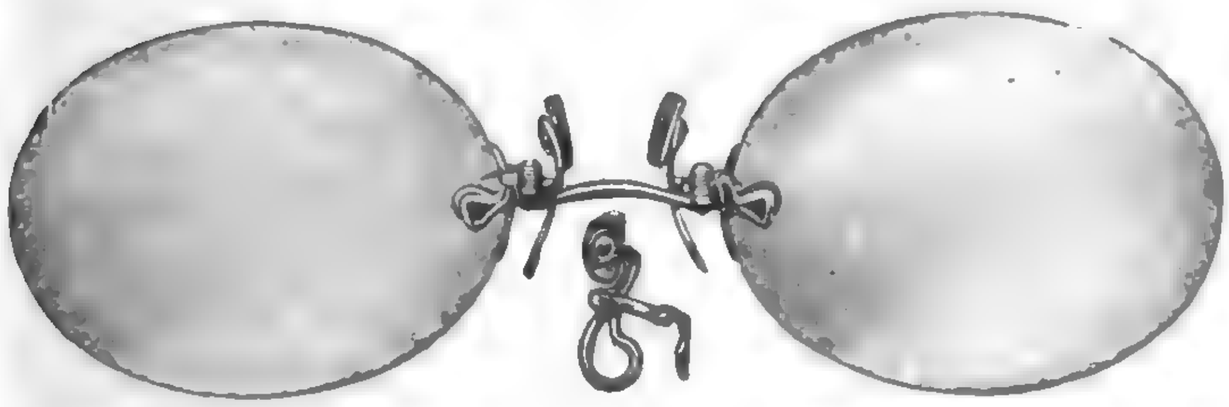
Strength is an important element of Realfit Finger Piece Mountings and Frames. That's one reason for their popularity. They give consistent service year after year.

Realfit Finger Piece Mountings wear longer and give greater satisfaction. The extraordinary care exercised in their manufacture, the materials which are used throughout, and the five inspections which every Realfit undergoes before being pronounced ready for shipment, all tend to assure STRENGTH, accuracy and neatness of appearance that is far from ordinary.

REALFIT OPTICAL PRODUCTS NJ



REALFIT *Finger Piece.*



Made in a complete assortment of Guards. Ask your Wholesaler.

NEW JERSEY OPTICAL Co.,
Newark, N.J., U.S.A.

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Re DIOPTRICS LIMITED.

(In Voluntary Liquidation.)

The Liquidators still have for immediate disposal the following stock which they offer at the reduced prices shewn, all nett cash. Frames are in new condition, lenses are packeted in single packets. If lenses ordered send list of sights required.

198	Rough Toric Cyls. to 4D.	at 19s. doz. prs.
50 doz. prs.	Rough Cyls., Plus and Minus,	at 13s. doz. prs.
140 doz. prs.	Uncut Sphero Cyls., Plus and Plus, 1st quality,	at 15/6 doz. prs.
60 doz. prs.	Ditto Minus and Plus, 1st qlty,	at 15s. doz. prs.
56 doz. prs.	Ditto Minus & Minus, 1st qlty.	at 15s. doz. prs.
30 doz. prs.	Uncut Plano Cyls. 1st quality, Plus,	at 14s. doz. prs.
7 doz. prs.	Ditto, ditto, Minus,	at 14s. doz. prs.
70 doz. prs.	Uncut Sphero Cyls. 1st quality, Plus and Minus,	at 15s. doz. prs.
86 doz. prs.	Ditto, 2nd quality, all combinations, mixed,	at 7s. doz. prs.
15 doz. prs.	Uncut Meniscus Minus Uncuts, 1st quality,	at 16/6 doz. prs.
34 doz. prs.	Uncut Peris Buffalo Round, 1st quality,	at 12s. doz. prs.
7 doz. prs	Uncut Torics, 2nd qlty, mixed,	at 14s. doz. prs.
5 8/12 doz.	G.F. Folders, 1/30, 1 and 0 eye,	at 13/6 doz.
31 doz.	S.T.O.Co. F.P. Mounts, 1/10, 12ct., Toggle and Figure, 8 Guards,	at 20s. doz.
13 doz.	Aristocrat F.P. Mounts, 1/10, 12ct.	at 21s. doz.
10½ doz.	Consol F.P. Mounts, 1/10, 12ct.	at 14s. doz.
22 doz.	D.Y.O.Co. F.P. Mounts, Toggle and Figure, 8 Guards, 1/10, 12ct.,	at 23s. doz.
3 5/12 doz.	Itsfits F.P. Mounts, No. 512, Toggle 1/10, 12ct.,	at 23s. doz.
2 4/12 doz.	Canadian Folders, 1/10, 12ct., 1 eye,	at 27s. doz.
2 doz.	Canadian Folders, 1/20, 0 eye,	at 22s. doz.
160 prs.	Rimless Spec. Sides and End pieces, 1/10, 12ct. wide straps,	at 20s. doz. prs.
8½ doz.	S.T.O.Co. 1/10, 12ct. R.G.C.S. 1 eye, heavy frames,	at 31s. doz.
11½ doz.	D.Y.O.Co. Ditto, 1 eye	at 31s. doz.
13 9/12 doz.	Ca.O.Co. 1/20, R.G.C.S. 1 and 0 eye,	at 22s. doz.
10½ doz.	Shuron 1/10, 12ct. R.G.C.S., 1 and 0 eye,	at 31s. doz..
37½ doz.	D.Y.O.Co. 1/10, 10ct. R.G.C.S. assorted eyes,	at 27s. doz.
7 5/12 doz.	R.G.C.S. assorted eyes, etc., job lot,	at 18s. doz.
8 2/12 doz.	R.G.C.S. 1/40, 0 eye	at 13/6 doz.
27 doz.	Rimless Bridges, 1/10, 10ct., assorted sizes and straps,	at 6/6 doz.
11½ doz.	G.F. Astigs, 1/10, 12ct. asstd. eyes,	at 34s. doz.
1 4/12 doz.	G.F. Astigs, 1/30, 00 eye,	at 18s. doz.
10½ doz.	G.F. Astigs, 1/20, D.Y.O.Co.	at 24/6 doz.
2 doz.	G.F. Rimless Astigs	at 15s. doz.
4	Retinoscopes	at 2/6 each.
3 4/12 doz.	Nickel Astigs, 1 and 0 eye	at 16s. doz.
3½ doz.	Gold Ear Chains	at 17/6 doz.
2½ doz.	G.F. Paragon Long Chains	at 6/6 doz.
11 spools	Eyeglass Cord	at 2/6 each.
118	R.G.S.S. Specs. assorted eyes and qualities	at 15s. doz.
4 doz.	Nickel S.S. Specs., 1 eye	at 8/6 doz.
16 doz.	Nickel C.S. Specs., assorted eyes,	at 8/6 doz.
9½ doz.	Steel C.S. Specs., assorted eyes	at 7s. doz.
5½ doz.	Steel S.C. Specs., 1 and 0 eye	at 7s. doz.
13½ doz.	G.F. Framed Boston Mounts, 1/10, 12ct. assorted eyes,	at 26s. doz.
126	Chatelaine Cases	at 2/6 doz.
7 doz.	American E. Cases	at 7/6 doz.
24	G.F. Lorgnettes	at 11s. each.
79 prs.	Straight Sides Steel E. & A. Joints,	at 3/6 doz. prs.
11 doz.	G.F. Boston Studs, assorted	at 5s. doz.
90	Black cedarwood Boxes, 12in. x 3in. x 3in., Sectioned off, slide lid,	at 2s. each.

Orders should be forwarded or further particulars obtained from:—

THOS. DUTTON (Dutton Armstrong & Co.)
4, Piccadilly, Manchester.)
or G. H. LAWTON (E. Lawton & Son,)
14, Brown St., Manchester.

Joint Liquidators.

By Order of the High Bailiff, Wandsworth County Court.

re the Lens Manufacturing Co.,
10a, Trinity Road, Balham.

Just off Balham High Road, and convenient for Balham Station (L.B. & S.C.R.), Trams and Bus Routes.

THE MACHINERY, PLANT & EFFECTS of an OPTICAL, GENERAL & MOTOR ENGINEERS & IRON FOUNDRY.

comprising among other things:

THREE 9″ & ONE 9½″ S.S.S.C. LATHES COMPLETE, one having 2¼″ Hollow Mandrill, Several 6″ & 8″ 4-jaw & Combination Chucks; 8½″ S.C. GAP LATHE; 2 Super-Realm Lathes; 4′ 6″ x 2′ PLANING MACHINE; 4 SENSITIVE DRILLING MACHINES; 2 Tool Grinding Machines; POWER HACK SAW; 8 h.p. ELECTRIC MOTOR by Harding Churton & Starter, complete; Quantity of Pulleys; Shafting & Belting; Vices; Two 4-SPINDLE LENS SURFACING MACHINES by "Bryant Symons"; Set of Taps, Stocks and Dies; Office Furniture; Blick Time Recorder; OPTICAL SMOOTHING & POLISHING MACHINES; Quantity of Steam Piping; Iron and Wood Moulding Boxes; 2 and 4 cwt. Ladles; 15 cwt. CUPOLA & BLOWER; Quantity of Optical, Toric, Smoothing, Cylinder and other Tools; Gauges; Patterns, etc., and numerous other effects which

HUGH F. THOBURN

is instructed to sell on the premises as above on THURSDAY, 8th December, 1921, at 11.30 a.m.

ON VIEW DAY PRIOR TO SALE.

Catalogues of the High Bailiff, Wandsworth County Court, Garrett Lane, Wandsworth; of the Official Receiver, 29, Russell Square, W.C.; and the Auctioneer, KENT HOUSE ESTATE OFFICES, Kent House Station (up side), Beckenham, Sydenham, 1529.

The Optician's Handbook.

Price 4s. 0d. Post Free.

An elementary text book required by every student of Optics.

It is an introduction to "The Study of the Refraction of the Eye, its Anomalies and their Estimation and Correction by means of Glasses.

The Hatton Press, Ltd.,

125, Fleet Street, LONDON, E.C.4

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Pin your faith to L.O.C. for all your Rx Work and you will have frequent cause for self-congratulation.

LONDON OPTICAL Co.,.

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris. France.

Also at—2, Str-Bureei, Bucharest. Roumania.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d. per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

OPTICIAN'S Outside sign wanted, also quantity rimless finished lenses and mounts. Box 3504, c/o "The Optician," 125, Fleet Street, E.C.4.

AUSTRALIAN OPALS. Direct from Australia. Single stones or quantities. Beautiful colours. Lists free. Optical goods or scientific instruments in exchange. Correspondence invited. Seward, Optician, Melbourne, Australia.

WANTED Haab's "Atlas of Ophthalmoscopy," also Ophthalmoscope non-luminous. Harris, 17, De Winton Street, Tonypandy.

FOR SALE. Sutcliffe trial frame, new condition. Box 3506, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

WANTED to buy optical business, in or near London. Box 3505, c/o "The Optician," 125, Fleet Street, E.C.4.

FOR SALE. Old established optical business in main thoroughfare of Glasgow. Low rental. Apply, Box 3497, c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 10*

D.B.O.A. experienced reliable manager desires change. Careful and expert refractionist (O. & S. methods), frame fitter, etc. Can assure employer of integrity, and thorough service. Box 5762, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACER (all-round) seeks situation (male). Box 5764, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED Sight-testing assistant required for Dublin, to help proprietor. Good class trade. Age 30-40. Replies treated in confidence. A.B., c/o J. W. Ross-Jenkins, 31, High Holborn, W.C.1.

ADVERTISING.

Our special direct campaign has proved a gold mine to many of our Clients—it may be equally successful to you.

Send us particulars of your proposition, and we will advise you free of charge.

JAMES SMITH, Ltd., 3 & 4, Lincoln's Inn Fields, London.
ADVERTISING AGENTS. Established 1869.

VISUAL OPTICS & SIGHT-TESTING
By LIONEL LAURANCE.
A New Edition, just out. Price 21s. 21s. 9d. post free.

GENERAL AND PRACTICAL OPTICS
By LIONEL LAURANCE.
A New Edition. Price 21s. 21s. 9d. post free.

The two ideal books for the acquirement of a knowledge of the subjects indicated by their titles.

THE HATTON PRESS, Ltd.,
125, Fleet Street, London, E.C.4

To Clock and Watch Manufacturers, Makers of Mathematical, Scientific, and Electric Instruments, Gramophone and Telephone Manufacturers, Engineers, etc.

IN LIQUIDATION.

For sale at a low figure in one lot as a going concern, lease, valuable plant and machinery, Stock-in-Trade, raw materials, office furniture of the

VICTORY ALARM CLOCK CO., LTD.,
274, Kentish Town Road, N.W.

Favourable Lease, excellent premises, unique complete installation of plant and machinery, all modern and some of the best Swiss and Continental Manufacture, largely automatic. Complete sets of tools (suppress). The business was established to compete with foreign imports, and everything necessary for standardised and economic mass production, not only of clocks but accurate instruments and similar articles, was installed. The whole compares with the best American and Continental concerns and it probably stands alone in this Kingdom. All in running order. Expert workmen available.

Order to view and summarised particulars of Messrs. Moore, Stephens & Co., Chartered Accountants, 2, Gresham Buildings, E.C.2., and Messrs. Dunn, Sorhan & Coverdale, Auctioneers and Surveyors, 11, St. Helens' Place, E.C.3. Telephone, Avenue 1506.

TO LENS MANUFACTURERS

For Disposal (In Perfect Condition)

1 12 Spindle Machine for Bi & Cyl. Lenses
1 20 „ „ „ Meniscus „
1 10 „ „ „ Deep Bi, Peris & Meniscus Lenses

Together with Blocks.

Full particulars on application to Box 5742, c/o "The Optician," 125, Fleet Street, E.C.4

FINEST
ROUGH CYLINDER BLANKS,

Also good 2nd Selection
A very attractive proposition for Export and cheaper work.

CHANCE'S GLASS USED.

ACTUAL MANUFACTURERS
ASSOCIATED OPTICAL WORKS, Ld.
5, Queen's Buildings, London, W.1
Near Tottenham Court Road.
No Connection with any other Firm. **Telephone: Museum 2216.**

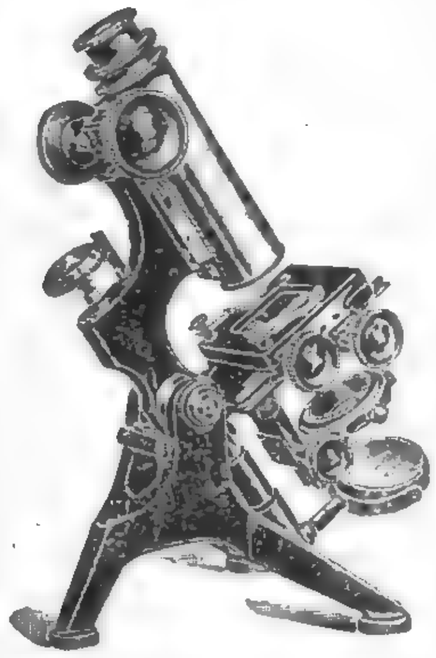
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

SELL WATSONS' BRITISH-MADE

MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,

313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1937.

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,

DANDURAND BLDG., MONTREAL.

Cable "Optical" A.B.C. Code 5th. Edition.

Telephone **JAMES B. SLY,** Central 10280.

9 & 10, EDWARD ST., WARDOUR ST.

LONDON, W. 1

To S.M.C., B.O.A. & I.O.O. DIPLOMA HOLDERS

Oak frames and modelled gold Arms for the diplomas The Arms of the S.M.C., City of London, and devices of the I.O.O., B.O.A. and Ph. Society in water colours, and framed dark oak, with descriptive engraved plate affixed, 27/6 each. Packed and put on rail.



Printed & Embossed Optical Stationery.

Steel Dies for use of Diploma Holders.

Electros of Coat of Arms & Optical Devices.

Engraved Seals, Prescription Forms, Signs, etc.

Price List on application.

Electro No. 12 Price 3/6

For Readers Abroad.

IN order to direct more pointedly the attention of buyers to whom THE OPTICIAN is sent in France, Spain, Russia, Italy, China and Japan, to the important matter of correspondence with our advertisers, we print herewith an announcement of which the English translation is given immediately below:

Any advertiser in this paper will be glad to hear from you, and to learn your requirements. He will quote prices and help you all he can.

Toutes les Maisons faisant de la publicité dans ce Journal seront heureuses de recevoir vos demandes et de connaitre vos besoins. Elles vous donneront des prix et vous aideront de tout leur pouvoir.

Todo avisador de este periodico tendra mucho gusto de comunicarse con Ud. y de atender sus pedidos. Cotizará precios y ayudará á Ud. en todo lo que se pueda.

Благоволите обратиться къ фирмамъ, помѣстившимъ свои объявленія въ этой газетѣ, съ Вашими почтенными запросами, съ изложеніемъ подробностей относительно Вашихъ требованій, по полученіи каковыхъ онѣ сообщатъ Вамъ цѣны и окажутъ Вамъ всякое, по возможности, содѣйствіе.

Tutti coló́ro che fanno annunzii in questo giorrale saranno lieti di conoscere le vostre richieste. Essi vi faranno offerta de prezzi e vi favoriranno quanto piú possibile.

本紙上掲載ノ廣告者ハ諸彦ノ御照會ヲ歓迎シ且御希望ニ應ジ商況ノ允ス限リ最モ得度條件ヲ以テ御取引ニ應ズルヲ以テ廣告者ハ何レモ信用ヲ重ンジ勉強シテ又出來得ル限リ御希望ニ添ヒ得ル様ニ仕向ケル筈ニ付奮テ御用命アランコトヲ希望ス

TO THE READER AT HOME or ABROAD

who receives this copy of THE OPTICIAN

— and is not yet a subscriber, we say —

You cannot do without THE OPTICIAN

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

A.—Advertisements unaccompanied by cash cannot be inserted. *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

QUALIFIED opticians required. Good experience and address essential. Excellent progressive positions offered. South Coast. Apply, Box 5761, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED first-class surface worker used to all kinds of ophthalmic work. Piece worker preferred, good rates and permanent position if satisfactory. Apply, Thomas Armstrong & Brother, Ltd., 78, Deansgate, Manchester.

LADY, age 23, seeks re-engagement in optical trade, 3 years' wholesale and 3½ years' retail experience. Birmingham essential. Box 5760, c/o "The Optician, 125, Fleet Street, E.C.4.

EXPERIENCED lens worker requires situation. Thoroughly used to all first-class prescription work. R. Talbot, 151, Monument Road, Ladywood, Birmingham.

EXPERIENCED Man, has organising ability, requires situation, good references. Apply, Box 5759, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS Refractionist, D.B.O.A., F.S.M.C., thoroughly reliable and accurate, requires position as branch manager or first assistant. Is not afraid of work or responsibility. Write Box 5758, c/o "The Optician," 125, Fleet Street, E.C.4.

QUICK, First-class, reliable rimless fitter seeks situation. Moderate knowledge of rimless and bevel edging. 8 years' experience. Apply Box 5757, c/o "The Optician," 125, Fleet Street, E.C.4.

FEMALE Glazier required, good all-round hand, used to best work only. Apply, Mayfair Optical Co., Ltd., 38, Blandford Street, W.1.

IMPROVERS, surfacing, two competent workers required immediately. Apply personally, Stigmat, Ltd., 67, Myddelton Street, Clerkenwell, E.C.1.

ASSISTANT, 18, requires position to gain further experience of sight-testing, knowledge of cameras and materials. Box 5763, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS rimless fitter, also glazer required. A. Mills & Co., 22-3, Verulam Street, E.C.1.

REFRACTIONIST, 40, long sight-testing experience, retinoscopy and ophthalmoscopy, good salesman, impressive manner, seeks engagement. Reply, Box 5749, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS fitter and surfacer requires situation (male), served apprenticeship. Box 5746, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED dispensing optician desires re-engagement as manager or assistant. Over 20 years' experience of high-class work with leading dispensing house. Capable salesman and fitter. Box 5744, c/o "The Optician," 125, Fleet Street, E.C.4.

SECOND YEAR Student at Northampton Polytechnic seeks situation with optician familiar with prescription work. P.V.T., 292, Lancaster Road, W.11.

GOOD All-round jobber required with experience in rimless glazing. Box 5743, c/o "The Optician," 125, Fleet Street, E.C.4.

MANAGER F.S.M.C., 35, tall and good address, married, desires appointment requiring ability and initiative. 20 years' sound all-round experience in London and provinces. Box 5756, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. (young) desires position with Manchester (or district) firm. First class experience and sound knowledge of practical work. Box 5754, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED by qualified optician, responsible position offering scope for accurate refraction, first-class salesmanship and energetic organising. In or near London. Box 5752, c/o "The Optician," 125, Fleet Street, E.C.4.

WATCHMAKER, improver, studying for S.M.C. exam. desires position with jeweller-optician. J. F. Hutchings, 42, High Street, Wincanton, Somerset.

POSITION required by one experienced in block and prescription work. Able to take charge of either. London or suburbs only. Box 5735, c/o "The Optician," 125, Fleet Street, E.C.4.

SIGHT-TESTING. Situation wanted, 30 years' experience, sole charge, can do repairs. B., 96, Hawthorne Street, N.F. Pool, Leicester.

ASSISTANT (D.B.O.A.), with considerable experience seeks position in the Midlands. Capable of taking charge. Box 5734, c/o "The Optician," 125, Fleet Street, E.C.4.

GOOD All-round gold worker, frame and rimless, or representative for wholesale firm, excellent references. Box 5738, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. first assistant, desires change. Capable refractionist, also fully practical. North preferred. Particulars and salary to Box 5737, c/o "The Optician," 125, Fleet Street, E.C.4.

RELIABLE Sight-tester, workshop experience, would like to travel for wholesale firm. What offers to Box 5732, c/o "The Optician," 125, Fleet Street, E.C.4.

COMPETENT refractionist seeks berth as an assistant for sight-testing department. Would consider part assistant and part workshop. Box 5733, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Man requires situation in London. 4 years' experience in workshop and sight-testing. Box 5741, c/o "The Optician," 125, Fleet Street, E.C.4.

OPTICAL and Mechanical instrument maker desires change, 10 years' experience in the manufactory. References. Scottish diploma for sight-testing. Box 5729, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACER, 24, seeks situation. Thoroughly accustomed to prescription work. T.D., 251, East India Dock Rd., E.14.

EXPERIENCED Young lady required for prescription department. Box 5736, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG LADY, 20, requires situation as invoice or account typist. 3½ years' experience. W.W., 52, Fitzroy Road, Regent's Park, N.W.

QUALIFIED refractionist, 30 years' experience in workshop, testroom and fitting, would accept berth as manager or under-manager. Box 5740, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED. Shell and gold worker for repairs and adjustments. Box 5727, c/o "The Optician," 125, Fleet Street, E.C.4.

METEOROLOGICAL and Scientific Instrument Maker, disengaged, requires position, maker or repairer, hand-turning, bench work, finishing, lacquering, own tools. 18 years' experience, any distance. F. Orford, 83, Ashmore Road, Paddington, W.9.

WANTED for India by Walter Bushnell, Ltd. A young single man, B.O.A. or S.M.C. State age, experience and fullest details re experience, character, etc., in strict confidence to Box 5717, c/o "The Optician," 125, Fleet Street, E.C.4.

Concluded on page 8.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

CONGRATULATIONS

to the Trade on knowing

A GOOD THING

when they see one.

Bi-Liptic Reg^d

BI-FOCAL

OPHTHALMIC LENSES

Manufactured by

UNITED KINGDOM OPTICAL CO., LTD.,

(Wholesale and Export Only.)

MILL HILL, LONDON, N.W.7

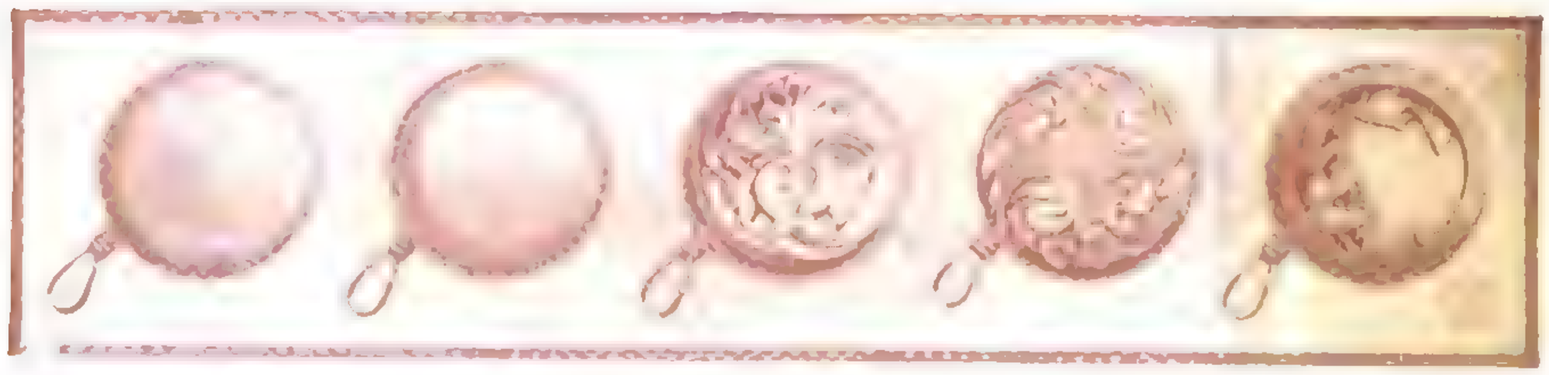
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

AMERICAN·OPTICAL·COMPANY.LIMITED

WELLSWORTH

AUTOMATIC EYEGLASS HOLDERS



For beauty of design and serviceability, Wellsworth Automatic Eyeglass Holders are leaders. Continual improvements made whenever the opportunity presented itself have made it possible for us to offer Wellsworth Automatic Eyeglass Holders as the most perfectly constructed eyeglass holders made. They are unequalled in quality—both the materials used and the workmanship being of the highest grade.

Wellsworth Automatic Eyeglass Holders are furnished in several different styles, from the plain finish to a highly decorated stamped design. Each style of design is beautiful in its particular category.

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 124 and 125, Fleet Street, London.
Printed by The Century Press, Finsbury, E.C.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT-MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1601 FRIDAY, DEC. 2, 1921.

Wellsworth M21 Bench Surfacing Machines.



Can be supplied with Automatic Polishing Attachments. Immediate delivery can be made from stock of Machines without benches.

WELLSWORTH

TRADE MARK (Regd.

OPTICAL PRODUCTS.

AMERICAN OPTICAL COMPANY, LIMITED,

39, Hatton Garden, LONDON, E.C.1

Reg'd at the G.P.O. as a newspaper PRICE 4d Subscription post free 12 months 17s.

Postage in United Kingdom

Digitized by Google THE OHIO STATE UNIVERSITY

Subscription including "Optical Almanac" post free 20s. yearly. The Hatton Press, Ltd., 123-5, Fleet St., London, E.C.4.

THE

PATENT L. W. ORTHOPS 167902.



THE L-W ORTHOPS OPHTHALMOSCOPE

This new instrument is entirely reflecting and eliminates most of the difficulties of ordinary ophthalmoscopy; with the minimum of practice, an excellent view of the fundus is obtained.

The instrument is worked by an ordinary small dry cell battery, measuring $3\frac{1}{4}'' \times 3''$.

It is an instrument that should be possessed by every sight testing optician who wishes to make ophthalmoscope examinations.

It can be obtained from any Wholesale Optical House, from whom a fully descriptive pamphlet can be had on application.

Manufactured by **GEORGE CULVER, Ltd., London, N.1**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

W.H.T.

NOTHING BUT THE **BEST** IS GOOD ECONOMY.

THEREFORE PLACE YOUR COMMANDS WITH THE

HOUSE THAT WILL GIVE YOU THE **BEST**

WORKMANSHIP & SERVICE

PRESCRIPTION WORK

EXECUTED PROMPTLY & EFFICIENTLY

OPTICAL SUPPLIES OF EVERY DESCRIPTION FROM THE TRIAL CASE TO THE EYEGLASS CHAIN

WALTER H. THOMPSON

66 HATTON GARDEN, LONDON, E.C. 1.

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

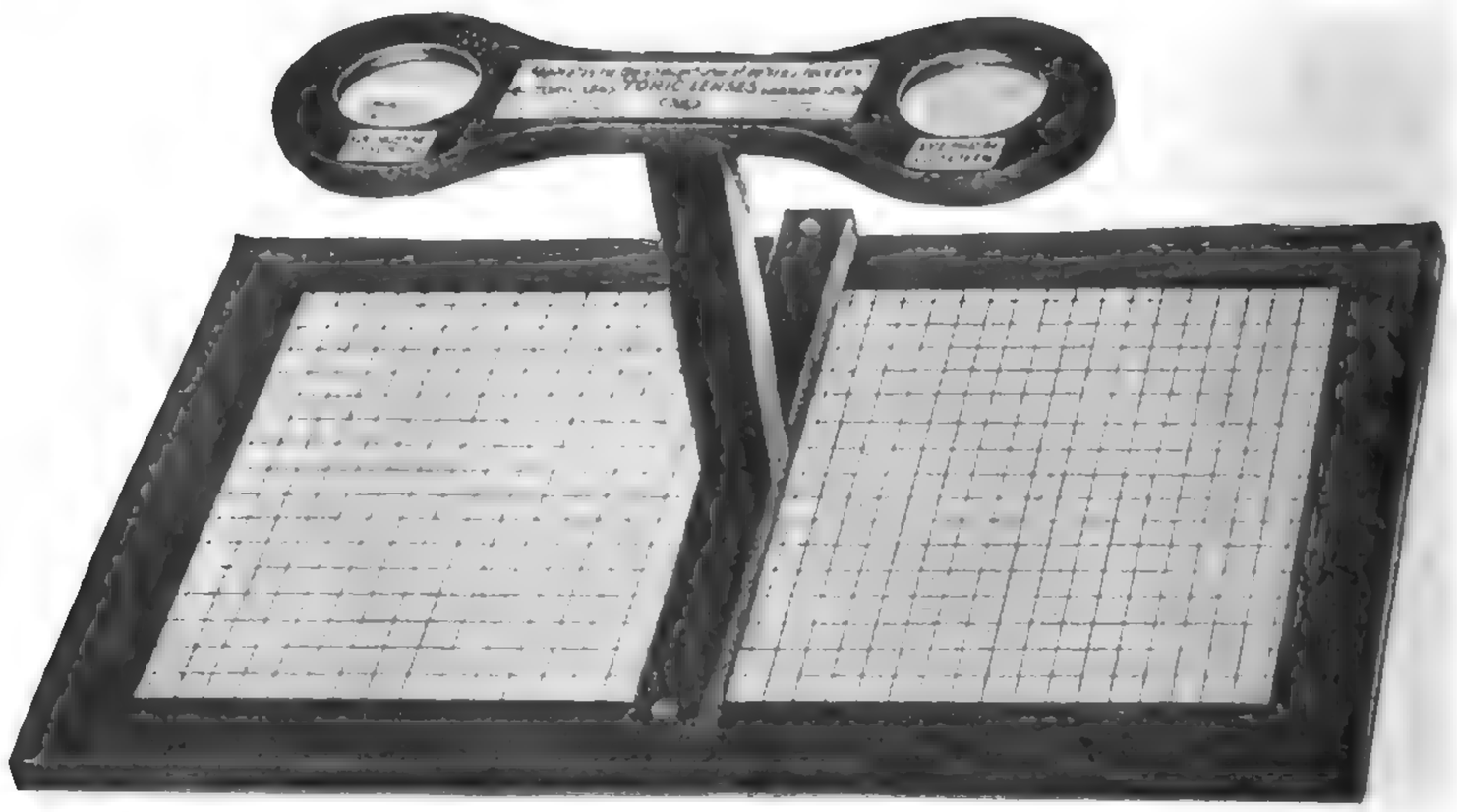
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

J&R F LTD

SIMPLIFIED FORM OF

TORIC DEMONSTRATOR



Designed for the Counter or Waiting Room Table.

Demonstrates itself.

No time lost explaining elaborate apparatus to clients.

No lights or working parts to get out of order.

Inexpensive.

Particulars on Application.

J. & R. FLEMING LTD.,

Telephone :
HOLBORN {814 / 815
HOLBORN {2788 / 2789} Prescription Dept.

136-148 Clerkenwell Road,
LONDON, E.C. 1.

Telegrams :
"OTTICO." LONDON.

Branches with Prescription equipment :

WALTER BRAHAM & Co. Ltd.
8, Key Hill Drive,
BIRMINGHAM.
Phone: Central 2500
Telegrams: "Brahma."

37, WESTGATE STREET,
CARDIFF.
Phone: Cardiff 44
Telegrams: "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1085.
Telegrams: "Ottico."

8, BRUDENELL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

J&R F LTD

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
The Rt. Hon. VISCOUNT HILL, L.C.C.

Upper Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Renter Warden
HARRY HYLTON-FOSTER. Esq., Past Master.

Director of Examinations
The Rt. Hon. Sir WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in May, 1922.

Membership—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* **Acting Clerk** *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT·MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year **Vol. LXII.** **No. 1,601**

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

Edited by CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. City 5616.

LONDON, FRIDAY, DEC. 2, 1921.

Cost of Qualification.—In the course of a letter that we printed a couple of weeks ago, criticising the too familiar announcement, "Sight-testing free," a statement was made that the examination fees of the Spectaclemakers Company had been recently increased. That statement was inaccurate; and we wish to give not only equal but greater publicity to the correction. The facts, supplied by the Official Instructor of the Spectaclemakers Company last week, are that the "quarterage" payable by all freemen of the Guild remains at the nominal figure of 4s. per annum. Examination fees also stand at the former amount of six guineas. The Spectaclemakers Company aims to make no commercial profit out of the Diploma Scheme; nor have the members of the Court any other interest in it than to encourage as many as possible of the opticians of the country to reach an adequate standard of technical knowledge and skill.

* * *

Other Expenses.—It would be quite unfair to diploma holders to imply that the cost of their "qualification" is only the £6 6s., or any other such sum, paid in examination fees. There has to be a considerable investment of

Digitized by Google Original from THE OHIO STATE UNIVERSITY

time and labour in acquiring even the most necessary rudiments of geometrical optics—"theory," without which all purely "practical" knowledge of the shapes and performances of spectacle lenses, is very insufficient for accurate sight-testing. Besides time representing money, there are books to be paid for, travelling expenses, and in most cases tuition, amounting in the aggregate to a substantial outlay. That outlay should be justified by adequate returns; but none the less, on the general principle of "passing it on to the consumer," advocated by our correspondent, Mr. J. N. Arnold, there is some room for difference of opinion. Generally speaking, the public who pay for professional and other services, are oblivious to any duty which may be said to rest on them, to pay for the cost of education as such. Everyone knows that a man may have had an expensive education, yet, by reason of the primitive differences among mankind, may be a worthless person.

* * *

At once it may be replied that the big expense of a medical qualification is recognised as justifying the level of doctor's fees; but that is not the whole truth. Rather, the doctor's fees are maintained because medical practice is a monopoly under licence from the State. The difficulty and cost of gaining admittance to this privilege is important only because it limits competition. If the cost is taken at £1,000 or more, it is an easy matter, taking due account of the expectation of active life, to calculate the yearly interest as annuities are calculated; and it will be found not to cover a large fraction of the fee charged each patient. Of course, the argument applies with all the more force in the case of a qualified sight-testing optician.

* * *

Legal Recognition.—The great need, and right, of the refractionists of this country, is to be granted just such a monopoly as is enjoyed by the doctors, pharmaceutical chemists and others, conditioned by safeguards for the public in the form of an examination or examinations to be passed by future entrants into the profession. This has been advocated by us since the early days of *The Optician*, and all except a small number of oculists are agreed as to its desirability. No doubt a good deal of public spirit is required in the promoters of Sight-Testing Bills, to face the fact that Parliament will not agree to an immediate weeding-out of incompetents, thus depriving the said incompetents of the interest vested in their business. This recognised fact involves two great drawbacks to enthusiasm and monetary sacrifice in the promotion of a Sight-Testing Bill. First, a number of years must elapse before the monopoly granted can become even fairly effective, in the hands of opticians duly qualified by examination. Second, there might be some tendency to depreciate voluntary "qualification," because all persons admitted on the register of opticians could claim to be "recognised" by the State; and it is uncertain how far the public might be influenced by misleading advertising in this sense. The American optometrists have been familiarised with such difficulties by the case of their own "exempts."

* * *

Voluntary Effort.—The difficulties just mentioned, which have been felt more than expressed, added to a conflict of party or personal ends, have moderated and thus far defeated efforts to get a Sight-Testing Act placed on the British Statute Book. Doubtless, however, by the march of events, Great Britain and Ireland must follow in this matter the example set over the Atlantic. Meantime, great good has been done and is being done by developing the voluntary system of qualification by examination. The majority of examined opticians here compare most favourably as regards their scientific knowledge, with the majority of examined opticians in any State or country having optometry laws. The British public have benefited immensely from the educational work that has been done. To opticians themselves, the commercial value of a diploma depends a good deal on how convincingly it is advertised to the public. Hitherto, the most liberal enterprise in that direction has been shown by the Spectaclemakers Company, in advertising both to the public and to the trade.

* * *

The alternative to the Company's activity, or rather the proper complement to it, is collective advertising by members of the trade themselves. That course has been strongly advocated, and there is no need to enlarge here on its advantages. Until time is ripe for a general agreement on promotion of the British Sight-Testing Bill, collective advertising by opticians who employ scientific methods, as distinguished from those who can only use "practical" guesswork or rules-of-thumb, is one of the things best calculated to benefit the former.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

The Visual Equivalence of Lenses—I.

By E. MAYER (Paris).

The *visual equivalence* of lenses is a special kind of *optical equivalence*. The latter relates to lenses that are placed before a combination of lenses at the same distance or more precisely to lenses the second principal point of which is placed at a fixed distance from the first principal point of the combination.

The formulas concerning the combination of thick lenses show that when a lens is placed before a combination, the cardinal abciss v of the image of an object is determined when the cardinal abciss u of the object and the focal length of the lens are given. Moreover, the magnification is also determined by these two factors. The *position* and *dimension* of the images given by two lenses placed successively before the combination at the same distance are the same, whatever may be the curvatures and thickness of these lenses and also the distance of object, provided the two lenses be of the same cardinal power.

The cardinal numbering is the only one that can afford this twofold equivalence. Any other system is devoid of such a consistency. This has been spontaneously acknowledged by Mr. Whitwell, and after him, but not spontaneously by Mr. William Swaine.

The conditions of visual equivalence are the same as of optical equivalence. They relate to correcting lenses that are placed before an eye, but it must be understood that the eye is in a fixed dynamic state as if it were a dead combination. If, to obtain the same vision with a second lens as with a former one, the eye is obliged to change its cardinal points, these two lenses are not *equivalent corrections*, even when they are equivalent at the optical point of view.

Correcting lenses are best placed at the anterior focus of the eye. But as it is impossible to get always the same position, especially with meniscus lenses, an allowance must be made accordingly.

The purpose of these two articles is to find the required allowances in order that two lenses be equivalent corrections when the eye has a determined dynamic state, whatever may be its amplitude of accommodation.

Let us call

- D cardinal power of a lens L
- D′ cardinal power of another L′
- a^m distance of the second principal points of L and L′
- $\left(\frac{1}{l}\right)^m$ distance of object to the first principal point of L

We shall consider a to be positive if L′ is more removed from the eye than L, and negative if nearer.

I demonstrated in *The Optician and Scientific Instrument Maker* (December 10, 1920) that the condition for these two lenses to get the same position of image is the following one:

$$(1)\quad D' = \frac{l}{1-al} + \frac{D-l}{1+a(D-l)}$$

or

$$(2)\quad D' = \frac{D}{(1-al)\,[1+a(D-l)]}$$

This condition has nothing to do with the amplitude of accommodation because the eye is supposed to be as a dead combination.

These two lenses do not give the same magnification. Let us call δ^m the distance of centre of rotation of the eye to the second principal point of L. The magnification given by L is

$$M = \frac{1+\delta l}{1-\delta(D-l)}$$

In order to express the magnification M′ given by L′, we must replace in this formula δ by $(\delta+a)$ and $\frac{1}{l}$ by $\left(\frac{1}{l}-a\right)$. Then

$$M' = \frac{1+\dfrac{\delta+a}{\left(\frac{1}{l}-a\right)}}{1-(\delta+a)\left[D'-\dfrac{1}{\left(\frac{1}{l}-a\right)}\right]}$$

or

$$M' = \frac{1+\dfrac{(\delta+a)l}{1-al}}{1-(\delta+a)\left[D'-\dfrac{l}{1-al}\right]}$$

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Applying formula (1), we find

$$M' = \frac{1 + \frac{(\delta+a)l}{1-al}}{1-(\delta+a)\left[\frac{D-l}{1-a(D-l)}\right]}$$

or

$$M' = \frac{1+\delta l}{1-\delta(D-l)} \quad \frac{1+a(D-l)}{1-al}$$

This gives

$$(3) \quad \frac{M'}{M} = \frac{1+a(D-l)}{1-al}$$

If we wish M and M′ to be equal, we must have

$$aD = 0$$

This means either $a=0$ or $D=0$.

But if the two lenses are not plano and are at different distances from the eye, it is impossible that they give the same magnification.

However, we shall say that they have an *approximative visual equivalence* if the ratio $\frac{M'}{M}$ or $\frac{M}{M'}$ differs from 1 by a quantity which does not exceed $\frac{1}{10}$ in absolute value.

Let us call

b absolute value of a when a is negative
Δ absolute value of D when D is negative

If D and a are positive, we have

$$\frac{M'}{M} - 1 = \frac{aD}{1-al}$$

$$1 - \frac{M}{M'} = \frac{aD}{1-al+aD}$$

Then $\frac{M'}{M} - 1$ is greater than $1 - \frac{M}{M'}$

If the least of these quantities is $< \frac{1}{10}$, the other is of course $< \frac{1}{10}$.

The condition of approximate visual equivalence is

$$\frac{aD}{1-al+aD} < \frac{1}{10}$$

or

$$(4) \quad a < \frac{1}{9D+l}$$

If D is positive and a negative, we have

$$\begin{cases} 1 - \frac{M'}{M} = \frac{bd}{1+b} \\ \frac{M}{M'} - 1 = \frac{bD}{1+bl-bD} \end{cases}$$

The condition of approximative visual equivalence is

$$(5) \quad b < \frac{1}{10D-l}$$

If D is negative, the same condition is given by the following inequalities

$$(6) \quad a < \frac{1}{10\Delta + l}$$

$$(7) \quad b < \frac{1}{9\Delta - l}$$

If we draw the lens L forwards or backwards, the approximatively equivalent correction is no longer of power D but D′. The same can be said if the lens L is replaced by another lens L′ of the same power D but more deeply curved.

We shall say that the displacement a is an *acceptable displacement* if it is sufficiently small in order that L and L′ have an approximative visual equivalence, For instance, if $D = +20^d,00$ and $\frac{1}{l} = 0^m,33$, we must have

$$\begin{cases} a < 5^{mm}4 \\ b < 5^{mm}0 \end{cases}$$

and if $\Delta = -20,^d00$ and $\left(\frac{1}{l}\right) = 0^m,33$, we must have $\begin{cases} a < 4^{mm}9 \\ b < 5^{mm}6 \end{cases}$

The *limits of acceptable displacements* are given by the following equalities.

$$\begin{cases} (4\text{ bis}) \quad a = \frac{1}{9D+l} \\ (5\text{ bis}) \quad b = \frac{1}{10D-l} \\ (6\text{ bis}) \quad a = \frac{1}{10\Delta+l} \\ (7\text{ bis}) \quad b = \frac{1}{9\Delta-l} \end{cases}$$

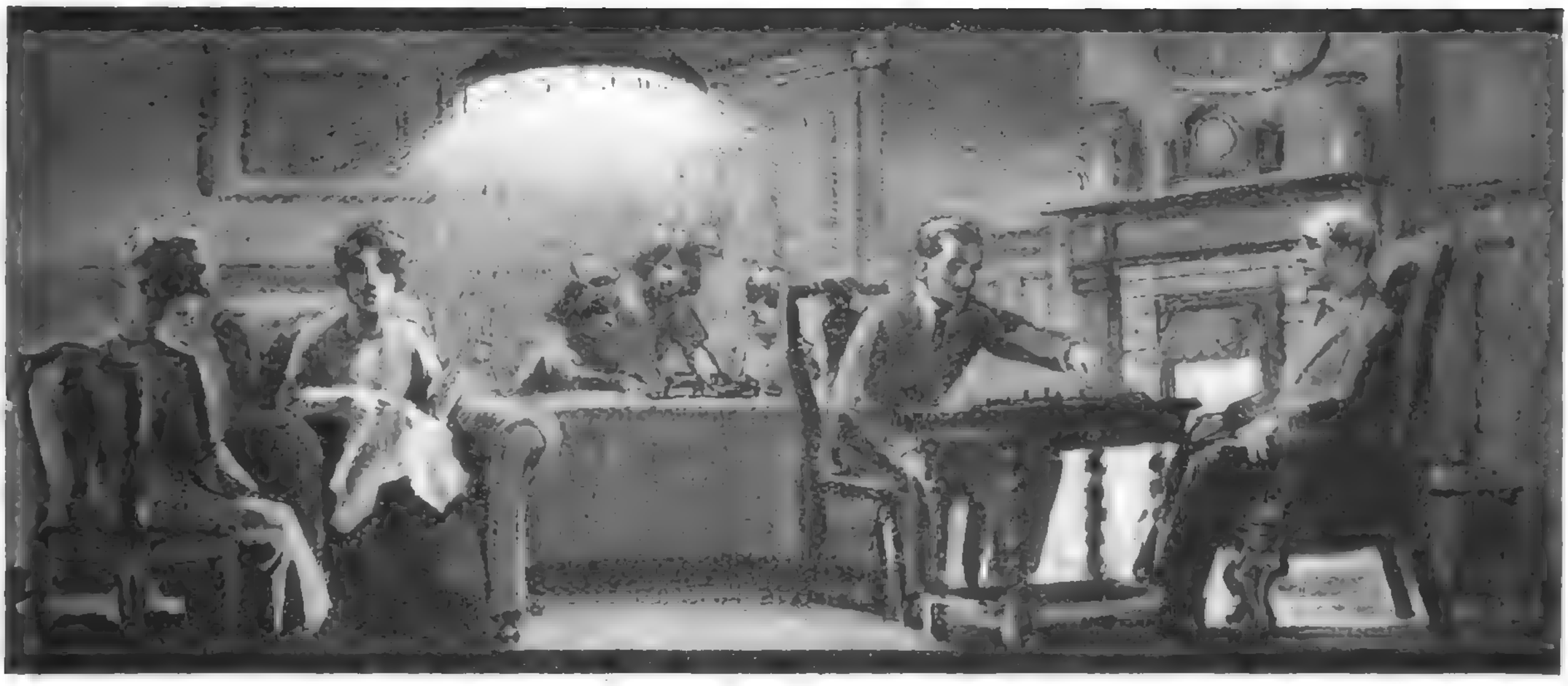
In the vertex numbered lenses, care must be taken not only that the equivalence be computed for distance $\left(\frac{1}{l}\right)$ but also that the displacement a due to increase or decrease of deepness satisfy equalities (4 bis.) and (5 bis.). Otherwise, these meniscus lenses would give such a change of magnification as to render them unfit to the equivalence intended for.

(To be Concluded).

Matter intended for the current weeks' "Optician" must reach this office on the Tuesday morning preceding publication.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

In Winter Homes as well—



Chance's 'CROOKES' Glass

is as desirable in Winter homes as on Summer beaches. Its message of relief and comfort to the public is just as strong when long evenings must be spent in artificial light as when long days were spent in the bright sun. It is profitable to be every bit as active now in spreading the message of Chance's "Crookes" Glass as at any other time. We will supply you free with excellent advertising matter—for newspaper advertising, for the lantern screen at cinemas, theatres, etc., and for your windows. Do not let your enterprise slacken off.

CHANCE BROS. & Co., Ltd.,
Glass Works,
Smethwick, Birmingham.



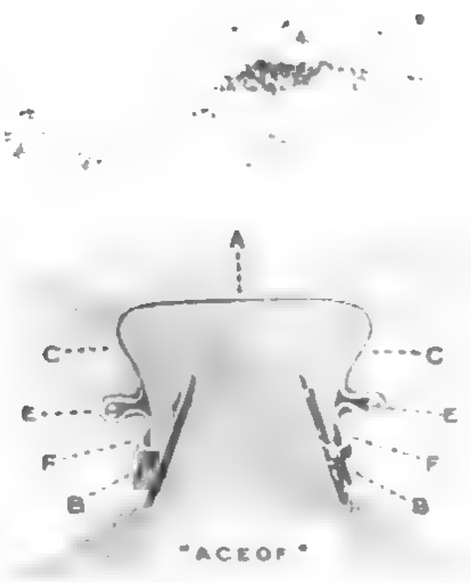
The late Sir Wm. Crookes, O.M., F.R.S. to whose researches was largely due the evolution of Chance's Crookes Glass.

B2

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Phone:—City 3225 (3 lines) *Telegrams:—Bulford, BARB. London.*

PATENT



MOUNTINGS

"ACEOF" REGD

NOTE the bridge A, with its graceful curves terminating at B.B. engaging the periphery of the lenses from C to B with a soft firm springy grip when fastened into position by the screw lugs E.E. Placquets adjustable at F.F. Simplicity is the Ace of its charm.

Made in Gold only—the first order for one dozen being supplied as follows:—Eight empty, and the remaining four made up as a fitting set in a nice case and a pair of plyers for adjusting.

"29 by 41."

The **"Aceof"** Mount lends itself to another important development—namely, what we term the Scientific Optical Size of Lenses—the 29 by 41 size.

The 29 by 41 is an ideal base measurement for a Lens size. Add or deduct as conditions require but maintain the basic shape of 29 by 41. An ideal shape governed by the muscular movement of the human eye.

Made by the firm whose Reputation for Prescription Work is:—*"Second to None."*

NEWBOLD & BULFORD, *Prescription House,* **GOSWELL ROAD, LONDON E.C.1**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Spectaclemakers Company

51st Examination, November, 1921.

Questions in General and Practical Optics.

WITH ANSWERS BY LIONEL LAURANCE AND H. OSCAR WOOD.

1. Find the diameter of the umbra and penumbra of the earth at the distance of the moon (240,000 miles) taking the earth's diameter as 8,000 miles, and the visual angle subtended by the sun from the earth as 32 minutes.

As the angle subtended by the sun is small, it may be assumed, without any serious error, that the axes of the penumbral cones are parallel. Let x be the width of the annular penumbral ring; then the total diameter of shadow as a whole is $(8{,}000+x)$ miles, while that of the umbra is $(8{,}000-x)$ miles. The value of x is easily found by circular measure thus:—

$$x : 240{,}000 :: 32 : 3438$$

Where 3438 is the value of the radian in minutes.

$$x = \frac{240{,}000 \times 32}{3438} = 2234 \text{ miles (approx.)}$$

This is the width of the penumbral ring, so that the diameter of the full penumbra is $8000+2234=10234$ miles, and that of the umbra is $8000-2234=5766$ miles.

2. A kaleidoscope is made with three plane mirrors each 2½ inches wide, and a small square object is viewed by it. Draw a diagram showing the appearance which would be seen.

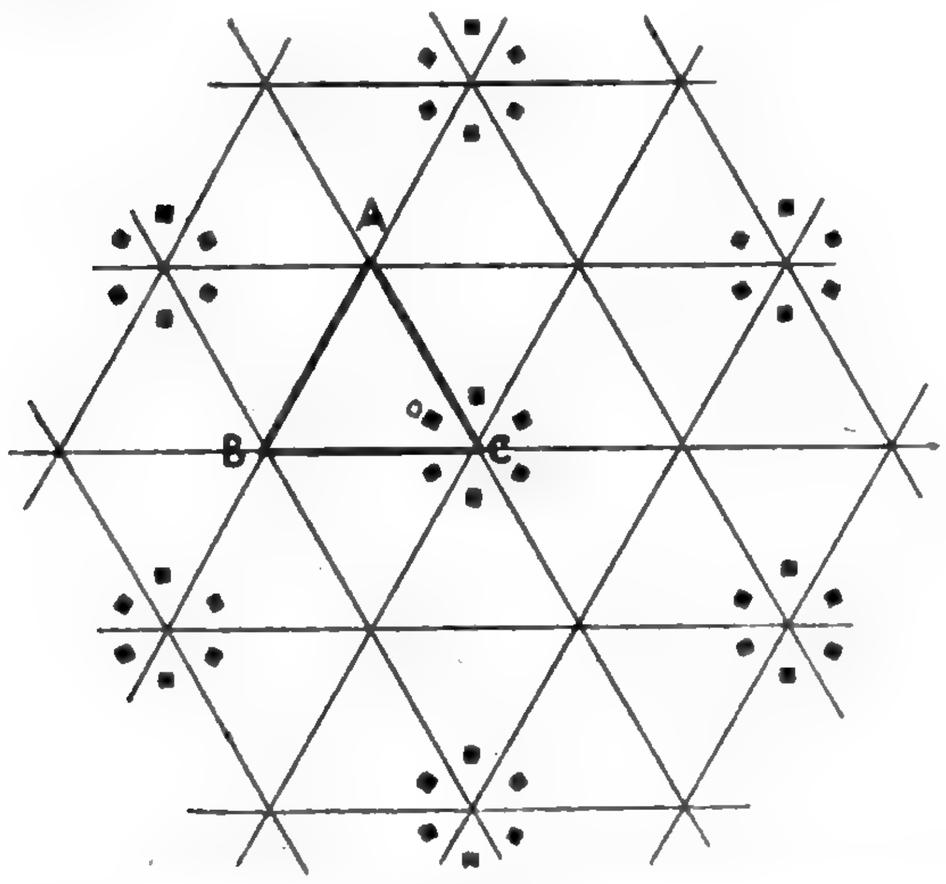


Fig. 1

Fig. 1 shows on a limited scale the arrangement of the images of the small object O placed near one angle of the triangle ABC formed by the mirrors. For convenience we shall consider this object as one of the images making up the first single group of 6 symmetrically disposed about the angle C. Around ABC there is formed the first series of 12 virtual equilateral triangles, each containing one image of the original square; the pattern formed, with respect to the first series, is very assymetrical. By including, however, the additional images found in the second and third series of triangles, 24 and 36 in number, respectively, ultimately we arrive at six complete groups disposed symmetrically around the original group at angle C. Theoretically, of course, the pattern could be traced *ad. inf.* The construction is very simple if we suppose O to be at the centre of the mirror triangle, for then every virtual reproduction of it would also contain one central image.

3. A railway carriage 8ft x 6ft. and 7ft. 6ins., high is lit by a single 50 c.p. lamp in the centre of the roof. What is the illumination on a horizontal surface in the corner 2ft. 6ins. from the floor?

As the surface illuminated is 2ft. 6ins. from the floor, it is 5ft. below the plane of the lamp; also the path of the light is oblique both to floor and walls, so that, with a semi-length and semi-width of 4ft. and 3ft. respectively, the distance d of lamp from the corner is

$$d = \sqrt{5^2+4^2+3^2} = \sqrt{50} \text{ feet}$$

Now the full expression for illumination is

$$I = \frac{C.P.}{d^2} \cos i$$

where i is the angle of incidence of the light, the result being expressed in foot candles. The actual value of i is not required, because the cosine in this case is obviously

$$\frac{5}{\sqrt{50}}$$

$$\therefore I = \frac{50}{(\sqrt{50})^2} \times \frac{5}{\sqrt{50}} = \frac{1}{\sqrt{2}} = .707 \text{ F.C.}$$

4. Sketch and describe the construction of some good form of lens measurer.

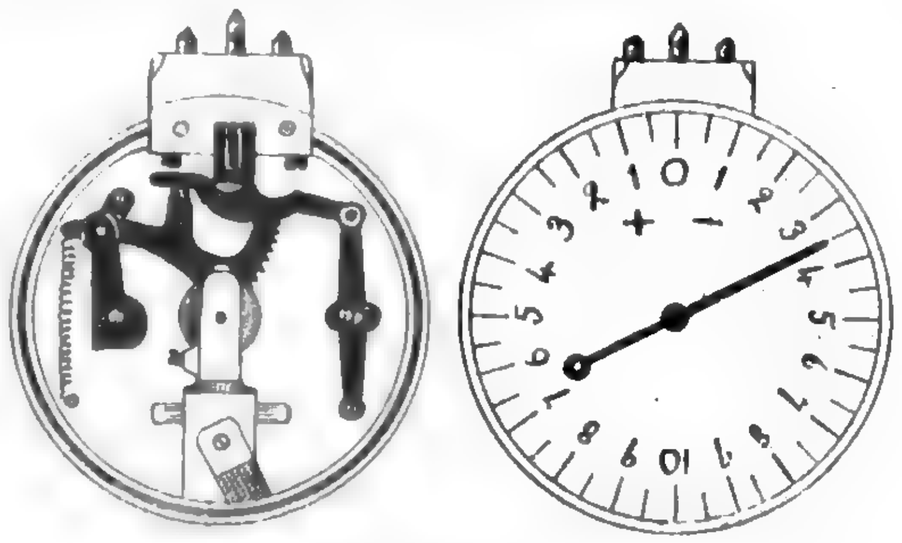


Fig. 2

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Fig. 2 represents roughly a good form of pocket measurer. For reasonably accurate work the scaling should not go beyond 10D., plus or minus. Instruments measuring to 20D. are made, but the scale is not sufficiently open, and in addition, no matter how well the measure be made, errors are apt to arise in the stronger powers, where some slight change in the index of the glass necessitates an appreciable alteration of curvature. Thus if the measure should show, say, +16.25D. one is never certain whether the surface is intended to be +16D. or +16.5D.

With regard to the mechanical arrangements, all instruments follow much the same lines, and do not warrant any particular description. The essentials are the two fixed and one movable leg, *lying in exactly the same plane*, the movable one being in contact with a system of amplifying levers actuating a rack and pinion; attached to the latter is the hand which revolves over the dial. An ordinary coil spring restores the lever system to a position of rest, while the hand is controlled by an ordinary hair spring. Means of adjustment are provided, usually by making one of the points screw stiffly in or out by means of a key.

5. A lens measurer having a span between its outer points of ¾in., and with its scale marked in diopters for a refractive index of 1.53, reads zero when applied to an optically plane surface. On inserting a small microscope cover glass between the surface and the centre point, a reading of +2.5 D. was obtained. What was the thickness of the cover glass?

The answer here is conveniently arrived at by aid of the ordinary simplified spherometer formula

$$r = \frac{d^2}{2S}$$

where S will represent the required thickness of cover glass, d the semi-distance between the outer points, and r the radius of an imaginary spherical surface of power +2.5D. on an index of 1.53.

From the well-known relationship

$$r = F(\mu - 1) = \frac{39.37}{2.5} \times .53 = 8.35'' \text{ (approx.)}$$

$$\text{Finally } S = \frac{d^2}{2r} = \frac{.375^2}{2 \times 8.35} = .0084 \text{ inch.}$$

The thickness of glass is, therefore, nearly .009 inch.

6. How is a Nicol prism constructed and what are its properties?

A Nicol prism is made from Iceland spar and forms a very efficient means of producing a pure polarised and fairly intense beam of light, and therefore it serves equally well as an analyser. This particular medium is chosen on account of the wide difference between the indices of its ordinary and extraordinary rays, these being, roughly, 1.66 and 1.48. In constructing the Nicol, the rhomb of spar, after some preliminary shaping, is cut diagonally in a direction perpendicular to its principal section—which is the plane containing the two half rays—and the two pieces are then re-united with Canada balsam, whose refractive index of 1.54 lies between those given above for the two rays. The angle of the cut is so arranged that the ordinary ray is incident on the layer of balsam at an angle greater than the critical angle for the two indices involved, with the result that this ray is reflected out of the way, while the extraordinary ray passes through the prism. Each ray, after entering the prism, is polarised in a plane at right angles to that of the other, so that the emergent light is also polarised, and although half the light has been lost in the deflexion of the ordinary ray, the result visually is very good. Two such Nicols form an admirable polariscope.

7. An equilateral right angled prism is placed on a table with its faces vertical, and a horizontal parallel beam of light falls on its hypothenuse at an angle of 20° to the normal. Trace the course of the beam.

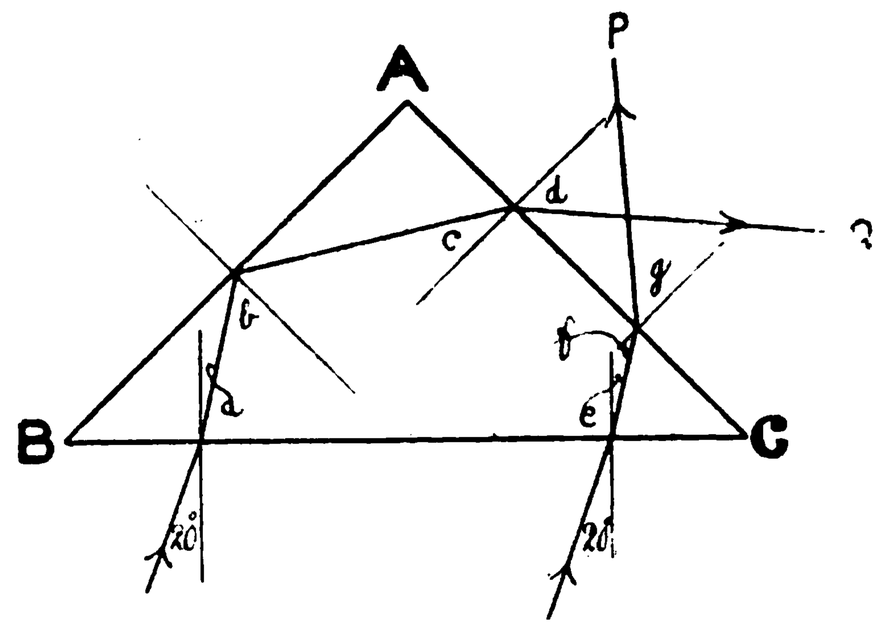


Fig. 3

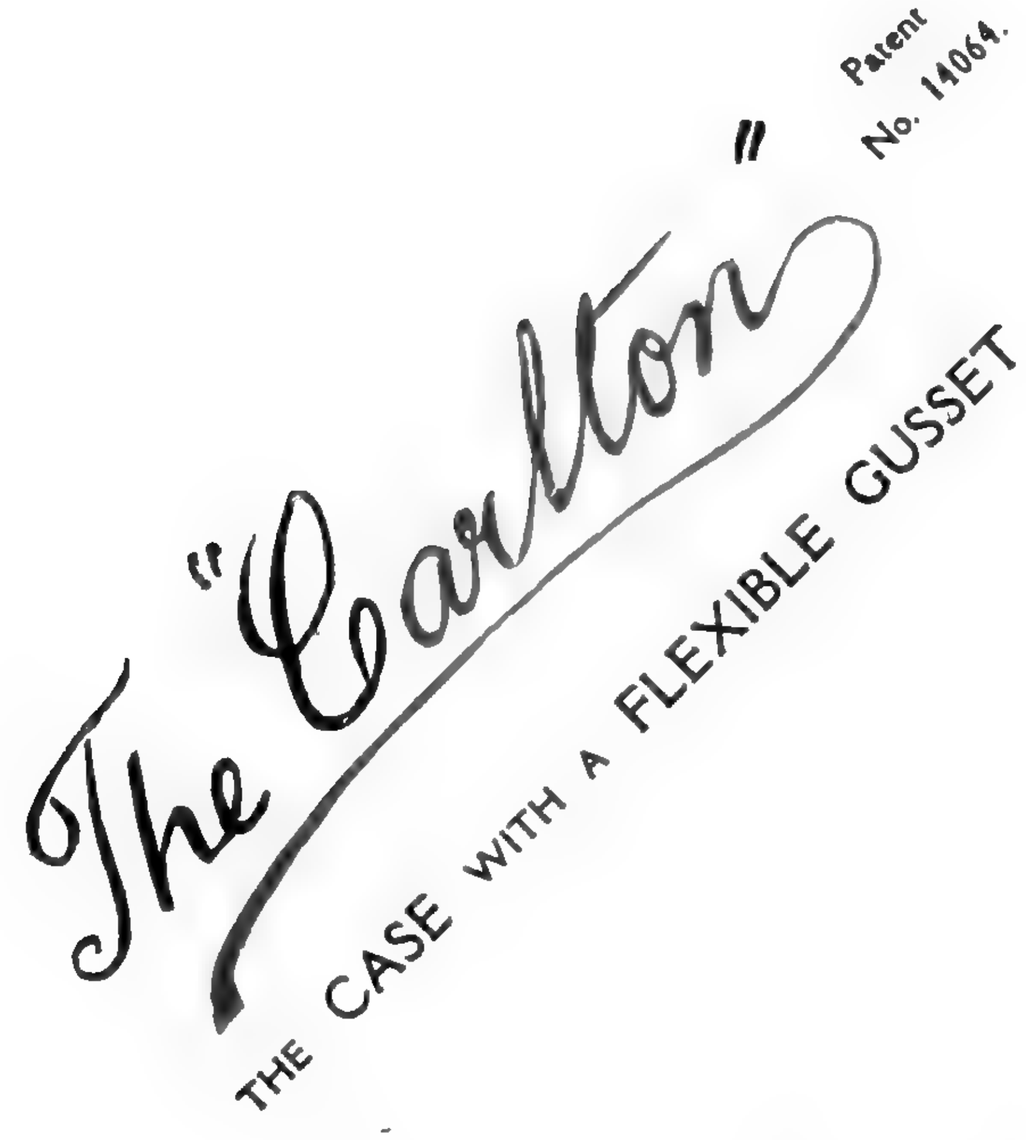
Of the whole beam falling upon the hypothenuse BC (fig. 3), roughly one half will be refracted straight through the two surfaces BC and AC, as indicated by the ray P, and the other half, indicated by the ray Q, will also emerge from the face AC after one internal reflexion at the face AB.

Assuming the prism to be made of ordinary crown glass, the angles of refraction, a and c of both rays have a value of approximately 13°, after entering at the hypothenuse. Considering first the ray Q, it is obvious by inspection that the angle of incidence b on the face AB is therefore 58°, which is much in excess of the critical angle for any type of

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE CASE

FOR TORTOISESHELL SPECTACLES.



SUPPLIED IN A CHOICE
RANGE OF LEATHERS

The MAXIMUM OF UTILITY with the MINIMUM OF INCONVENIENCE.

NEWBOLD & Co.,
P. & S. NEWBOLD,
72 and 74, GRAY'S INN ROAD, LONDON, W.C.1

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

"WERTEX"

WILLMOTTS'

LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.

——— *F.S.M.C., F.I.O.*

Messrs. Willmotts Ltd.

Evesham. *London, 31-10-21.*

Dear Sirs,

Enclosed please find Cheque for September A/C.

Allow me to heartily congratulate you on "WERTEX" cases. I think you have succeeded in now giving us a case equal in every way to anything I have seen and at a lower price.

As long as you can supply me with a case similar to those of your first consignment you can rest assured that other makes will have no further consideration.

With all good wishes for the "WERTEX" future.

I am, Yours faithfully.

The above is one of many unsolicited testimonials. We asked this gentleman if we might use his letter & received the following reply:-

——— *F.S.M.C., F.I.O.*

Messrs. Willmotts Ltd.

Evesham. *London, 4-11-21.*

Dear Sir,

Thanks for yours of this morning.

By all means use the letter and if it brings you increased business I can only say you deserve it.

I am, Yours faithfully.

Samples may be had from your Dealer or direct from the Manufacturers—

WILLMOTTS LIMITED,

EVESHAM, Willmotts Ltd WORCESTERSHIRE,

ENGLAND.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

glass. The ray thus proceeds to the face AC, being incident thereon at the angle $c = 32°$, and is refracted out, making the final angle of emergence d somewhere about 50°.

The ray P, also by inspection makes an angle f of 32° with the normal to AC, so that the angle of emergence g likewise has a value of approximately 50°.

8. Describe the various types of bifocal lenses, and state the advantages and disadvantages of each.

Broadly speaking, bifocal lenses may be divided into four groups, viz., the old Franklin or split bifocal, the cement, the solid or one-piece, and the fused or inset. The disadvantages of the first are manifest, for whatever form the dividing line may take, the division is obvious both to wearer and observer and difficulty may be found in keeping both upper and lower secure in the same eye-wire. They are, of course, out of the question in the ordinary type of rimless eyewear.

The cement form may be made perfect from a centering point of view, but here again the division of the two powers is obvious, the edge of the segment is liable to collect dirt, and there is the possibility of the balsam deteriorating, resulting in the formation of Newton's rings, or the detachment of the segment altogether. It is, however, a cheap form of bifocal, and the reading power can be easily altered.

The solid bifocal, when properly made, can be correctly centered in both upper and lower, and the division is not unduly conspicuous. Alteration of the reading power is, of course, impossible.

The fused bifocal, which depends for its added lower power on the insertion of a highly curved flint segment, is the most inconspicuous of all, and for that reason has found considerable favour, and the external curvatures of both surfaces are uniform over both upper and lower. Centering of the lower power is, however, apt to be faulty, which gives rise to the production of coloured fringes around print, etc., the more so on account of the highly dispersive nature of the glass used for the segment. Like the solid type, alteration of the reading power is impossible.

9. A toric lens has the formula

$$\frac{+6D.\ cyl.\ ax.\ 180° \frown +7.5D.\ cyl\ ax.\ 90°}{-2.5.D.\ Sph.}$$

How can a prismatic effect of 2.5 prism diopters, base in, be obtained with this lens?

The power in the horizontal meridian of the lens is +5D, being the combination of the −2.5 D. sph. and the +7.5D. toric power, having its axis at 90°.

Working from the ordinary formula

$$P = DC.$$

where P is the prismatic effect in prism diopters, D the power of the meridian involved and C the amount of decentration in cms., we have

$$2.5 = 5C.$$

$$\text{whence } C = \frac{2.5}{5} = .5 \text{ cm.}$$

The power being positive and the base required inwards, the direction of decentration is also inwards.

10. Describe with sketches some good form of achromatic magnifying glass.

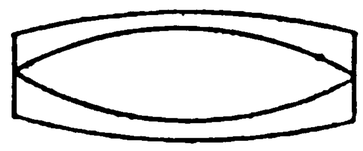


Fig. 4

A good example of this type of glass is the Steinheil loupe, which, besides being achromatic, is also aplanatic to a fair degree. The most general form consists of a high power bi-convex crown lens enclosed by, and cemented to, a pair of concave flint menisci, as shown diagrammatically in fig. 4.

There is a large variety of achromatic magnifying glasses on the market, many of them adapted to special purposes, having special correction in some direction, *e.g.*, for flatness of field, or even a reversal of the usual positive curvature.

11. A long tank filled with water of refractive index 1.333 has an equiconvex lens of refractive index 1.58, thickness $\frac{3}{4}$in., and each surface having a radius of curvature of 2 inches fitted in one end. Find the position of the principal, focal, and symmetrical planes, and of the nodal points.

This question may be solved in several ways, *e.g.*, by direct, though rather cumbersome formula, by calculation from first principles of the course of the paraxial beam, or by the theory of elements, as developed by H. Dennis Taylor in his work on Applied Optics. It is here worked from the Gauss equation, which one does not see employed very often nowadays.

It will be remembered that, in order to preserve the symmetry of the equation, the following convention is adopted. If the beam is supposed to be travelling from left to right, all distances measured to the left are negative, and those to the right positive; while

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

thicknesses are considered negative. In this particular case there are three media, air of $\mu_1=1$, glass of $\mu_2=1.58$, and water of $\mu_3=1.333$, with one thickness $t=.75''$. All lengths are "reduced" by dividing them by the μ of the medium to which they pertain.

Let F_1 and F_2 be the powers of the two refracting surfaces, and r_1 and r_2 their radii,

$$F_1=\frac{\mu_2-\mu_1}{r_1}=\frac{1.58-1}{2}=.29$$

$$F_2=\frac{\mu_3-\mu_2}{r_2}=\frac{1.333-1.58}{-2}=.1235$$

The reduced thickness $t=-\frac{.75}{1.58}=-.4746$

Let v be the final image distance; here, as the object distance is infinite, v becomes the posterior principal focus F_p.

The general form of the equation is

$$v=F_p=\frac{Cu+D}{Au+B}$$

where $A=F_1F_2t+F_1+F_2$ $\quad C=F_1t+1$

$B=F_2t+1$ $\quad D=t$

With more than two surfaces these expressions become unwieldly, it being then necessary to work out the values of A, B, etc., from the well-known continued fraction.

Evaluating $A=\{.29\times.1235\times(-.4746)\}+.29+.1235=.3965$

$B=\{.1235\times(-.4746)\}+1=.9414$

$C=\{.29\times(-.4746)\}+1=.8624$

$D=-.4746$

Actually we do not make any further use of D as a separate factor.

Then the posterior equivalent focal distance

$$F_p=\frac{\mu_3}{A}=\frac{1.333}{.3965}=3.36''$$

The anterior equivalent focal distance

$$F_a=-\frac{1}{A}=-\frac{1}{.3965}=-2.52$$

The first principal point, as measured from the first surface, is

$$P_1=\mu_1\left(\frac{1-B}{A}\right)=\frac{1-.9414}{.3965}=.148''$$

The second principal point, measured from the second surface, is

$$P_2=\mu_3\left(\frac{C-1}{A}\right)=1.333\left(\frac{.8624-1}{.3965}\right)=-.46''$$

The anterior symmetrical plane measured from the first surface

$$S_1=\mu_1\left(\frac{-1-B}{A}\right)=-\left(\frac{-1-.9414}{.3965}\right)=-4.8\text{ }\prime$$

The posterior symmetrical plane, measured from the second surface

$$S_2=\mu_3\left(\frac{C+1}{A}\right)=1.333\left(\frac{.8624+1}{.3965}\right)=6.26''$$

In other words, $S_1=2F_a$ and $S_2=2F_p$

The nodal points N_1 and N_2 are each displaced from the principal points P_1 and P_2 towards the denser medium (water) by an amount equal to $F_p-F_a=.84''$

Therefore, N_1 is $.148+.84=.988''$ from the first surface, and N_2 is $-.46+.84=.38''$ from the second surface.

Fig 5 is drawn to scale and shows the position of the various points and planes.

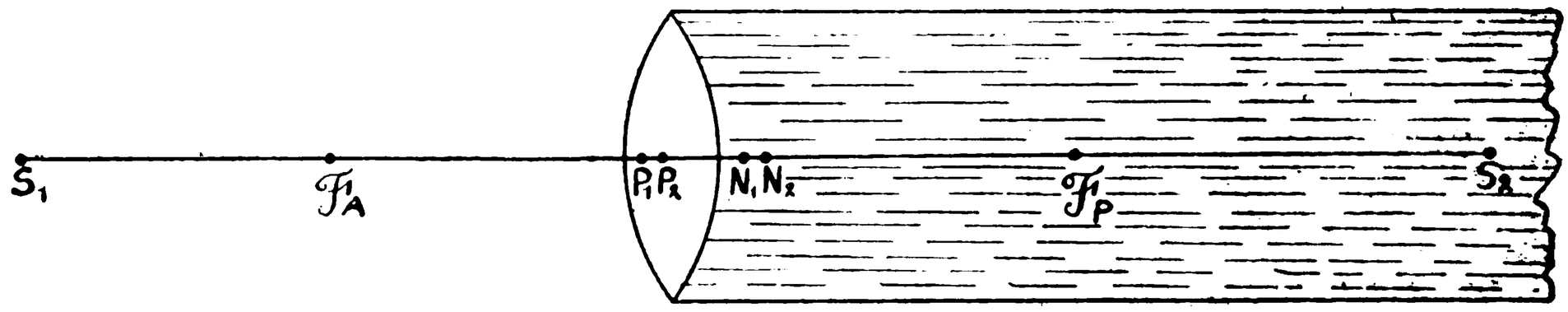


Fig. 5

12. What is ultra-violet light? Mention some substances which are very transparent and very opaque to this light, and state for what purpose they are employed.

Ultra-violet light in general is that portion of the spectrum lying beyond the visible violet, where the wave-length is too short, or the frequency of vibration too high to excite the sensation of sight. It is the region of great activity with respect to actinism. The most common example of the power of ultra-violet to produce chemical changes is found in the ordinary photographic plate or film, which is comparatively insensitive to visible radiations, especially towards the red end of the spectrum.

The classic example of transparency to ultra-violet radiations is found in quartz which, in a suitable form, is always employed for the lenses, prisms, etc., of instruments used in the investigation of short wave-lengths. Fluorite also has a good transparency for ultra-violet.

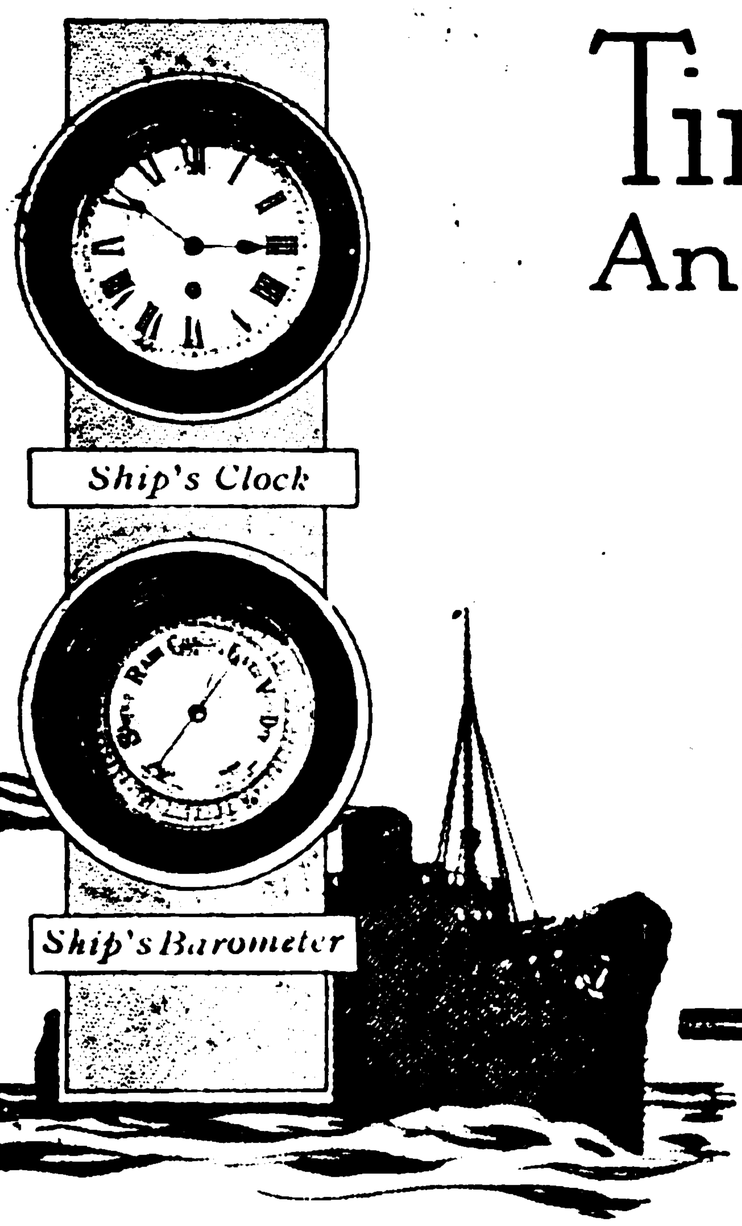
When transmission for the visible spectrum

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

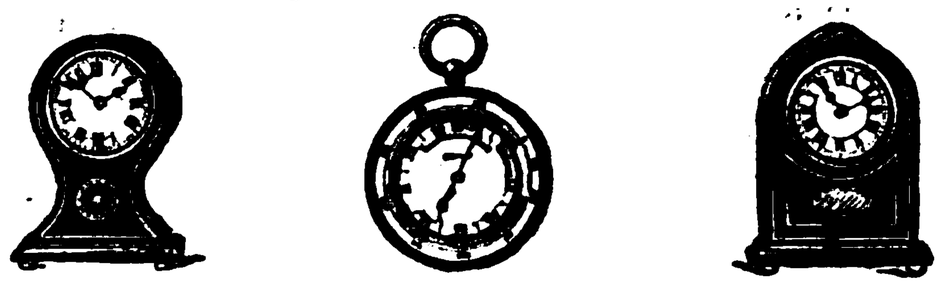
T. A. R. & Co.

"THE ALL BRITISH HOUSE."

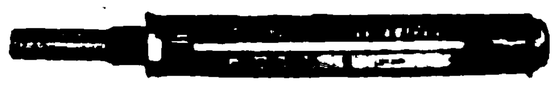
Over 2,000 Designs in Aneroid Barometers.



Time and Tide
And Ship's Instruments



T.A.REYNOLDS & Co
40-1-2 PERCIVAL STREET,
LONDON E.C.1



Steam-pipe Thermometer



Hydrometer

Telegrams—
"THERBAROME. LONDON."

Telephone—
339 CITY.

Showrooms and Offices at above address.

If you are a Retailer and need ORIGINAL LINES in Barometers, Clocks and Thermometers, write us, and although we will not supply you direct, we will put you in touch with the Nearest Wholesale House.

WHOLESALE AND SHIPPING TRADE ONLY.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

STRENGTH

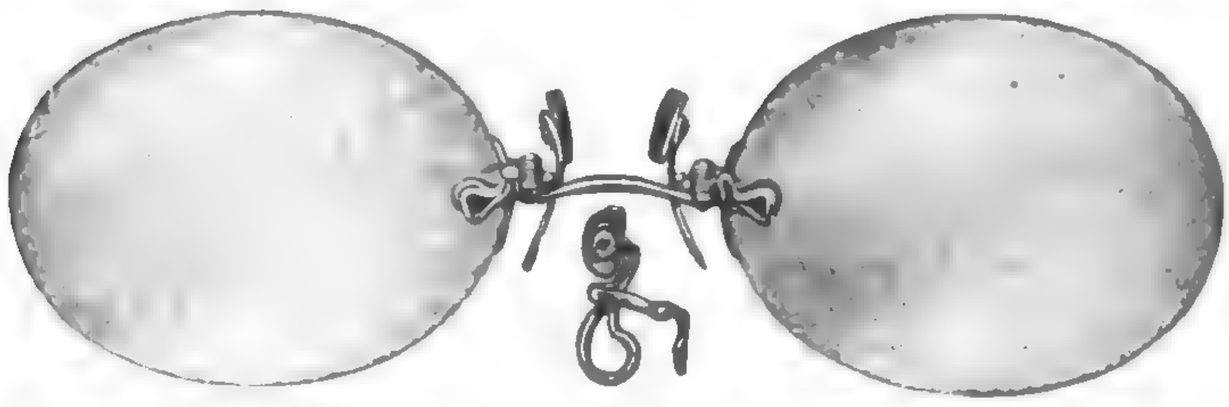
Strength is an important element of Realfit Finger Piece Mountings and Frames. That's one reason for their popularity. They give consistent service year after year.

Realfit Finger Piece Mountings wear longer and give greater satisfaction. The extraordinary care exercised in their manufacture, the materials which are used throughout, and the five inspections which every Realfit undergoes before being pronounced ready for shipment, all tend to assure STRENGTH, accuracy and neatness of appearance that is far from ordinary.

REALFIT OPTICAL PRODUCTS



REALFIT *Finger Piece.*



Made in a complete assortment of Guards. Ask your Wholesaler.

NEW JERSEY OPTICAL Co.,
Newark, N.J., U.S.A.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

is required, together with comparative opacity to ultra-violet, the admixture of lead to ordinary crown glass greatly increases its natural resistance to these waves. Thus all forms of flint glass are very opaque to short radiations. X-rays themselves are merely ultra-violet of extreme wave shortness and high frequency, and for the protection of operators heavy lead glasses are employed in the form of bowls surrounding the tube, or in large sheets behind which the worker may stand. Also lead rubber in the form of aprons, gloves, masks, etc., is largely used.

As a rule, highly coloured glass is opaque to ultra-violet. Thus a deep amber crown may be almost as efficient as a heavy white flint. For visual protection, without marked coloration Crookes' A, and to a greater extent, B glass is fairly opaque, the latter being very useful to workers in power stations, kinema studios, etc., where high frequency vibrations are abundant.

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full.

The Visual Field.

Sir,—Mr. Whitwell's article in your last week's issue is of extraordinary interest and of great importance. It will reward a prolonged consideration. Without making an exhaustive criticism, I think a few comments may be useful firstly to emphasise its value and secondly to draw attention to the ambit of the enquiry; for Mr. Whitwell has used the expression "field of vision" in an unusual sense, and I think this may mislead at first sight. Now 'Field of Vision' ordinarily means the totality of the external world which the eyes perceive when gazing at a fixed object. Mr. Whitwell uses it to connote the impressions received by the mind when the eyeballs move to follow a moving "fixed object," to speak paradoxically. In certain diseases, patients lose their "field" and may still retain the power of fixation. In other words, their field is gone but they could still perform Mr. Whitwell's experiment.

Suppose the two eyes look at a spot of light standing out from a black distant background, its distance is estimated largely by the converging effort of the two eyes in getting a single image, but such estimate is not very accurate. Ordinarily, one is greatly helped by the "field," neighbouring objects seen simultaneously, give us assistance. Now, in passing from one object to another, a second factor comes in, viz., *memory*. Suppose the light is at *a* in Mr. Whitwell's diagram, fig. 3, and then at *b*. In comparing their relative positions by rolling the eyeballs, the mind first estimates the distance of *a* and *remembers it* to compare the distance of *b*. If there are two lights, not only is there *memory*, but the peripheries of the retinæ give *simultaneous* impressions; an entirely different condition of things.

Many people when first taking to glasses complain of edges of tables, straight edges, etc., appearing curved. It may be Mr. Whitwell's research gives part of the explanation but I am strongly of opinion that the *simultaneous* impressions received by the peripheries of the retinæ have more to do with it. I think his Table II. shows this. According to this, decentering as much as 20 mm. only causes slight curvature of the image plane, whereas properly centered lenses give enormously greater concave curvature. Now, when we put on a pair of +4D. lenses decentered to 40 mms. we see an almost ludicrously exaggerated *bulge* on any plane surface we look at. This is an instantaneous impression quite different from any *hollowness* observed with properly centered lenses. The question is psychological as well as optical and, therefore, the wording of Mr. Whitwell's conclusions must be read as strictly *optical* or modified to exclude such psychological terms as "appear to the eyes." I cannot too strongly commend this fascinating article to all students of physiological optics.

J. H. Tomlinson, M.R.C.S., L.R.C.P.

The Aitchison Memorial Scholarship.

Sir,—I have pleasure in informing you that the Aitchison Memorial Scholarship has been awarded to A. J. S. Taylor, 13, Bond Street, Ealing, W.5.

The Scholarship, as many of your readers will know, was founded in memory of the late Mr. James Aitchison, and is tenable at the Northampton Polytechnic Institute for two years, 1921-1923.

The Committee hope that A. J. S. Taylor's tenure of the Scholarship will prepare him for a successful career in the Optical Industry.

Henry Purser.
Hon. Treas. and Sec.
35, Charles Street, Hatton Garden, E.C.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Spectacle Makers Company.

Sir,—I am extremely sorry that, in my letter to *The Optician and Scientific Instrument Maker* of November 18th, I inferred that the Spectaclemakers Company had increased their Examination Fees and Annual Subscription. My remark was based on information which I received, and believed to be true, and I should like to apologise to the Worshipful Company for any annoyance caused.

I should also like to thank Mr. Lionel Laurance for pointing out my error.

J. N. ARNOLD.

Kew Road, Richmond.

Early Sight Testing.

Sir,—I have read the letters of your two correspondents, signed "Notrom" and "Opticus" and feel confident they were not written by ladies, and equally sure they were not written by gentlemen, as no gentleman is ever ashamed to put his name to what he writes. Letters appeared in last week's issue from Mr. Charles Sheard, Mr. Lionel Laurance, and Mr. M. Heilbron, and all of those *gentlemen* signed their letters, so I can only think that "Notrom's" and "Opticus's" ignorance must be their excuse.

G. BRAHAM.

167, The Grove, Hammersmith, W.6.

*** We cannot possibly agree with our correspondent that letters published in a newspaper under a pseudonym are, on account of their anonymity alone, at all in bad form. Notable statesmen and great literateurs have often engaged in newspaper correspondence over nommes-de-plume; and in the leading public journals of to-day, pseudonymous correspondence sometimes includes some of the most important items of news or information. As is done in most newspaper offices, we frequently consign to oblivion letters over a pen-name which attack the character or conduct of named individuals; but Mr. Braham has not the slightest ground for complaint on this score, for there is no attack on him. True however, no one is under any moral obligation to reply to a question by an anonymous writer. So it is now for our two correspondents to decide if they choose to reveal their identity.

A novel instrument—the Laurance-Wood reflecting ophthalmoscope—announced this week by Messrs. George Culver, Ltd., provides a most important addition to the equipment of sight-testing opticians. A preliminary note was published in our issue of Oct. 28th.

Glasses for Insured Persons.

Very considerable interest—and indeed not a little concern—has been felt among retail opticians with regard to the proposals of the National Insurance Beneficent Society. It will be remembered that the suggestions of the "Beneficent Society" were put forward by its joint Honorary Secretaries, Messrs. G. W. Cantor and P. Rockliff, in a circular letter which we reprinted in our issue of July 29th last. And since that time very considerable discussion on the matter has taken place in trade circles—that is, in private conference—but it is obviously most desirable that the subject should be ventilated as fully as possible; for only by means of a clear mutual understanding and frank co-operation between all retail opticians, can the legitimate interests of the retail trade be protected against what had the appearance of an organised attack on retail profits. Some considered opinions and proposals on this question we have heard of, but have not been given freedom to publish. We are now, however, at liberty to state that by the enterprise of the National Association of Opticians, a specific arrangement has been come to, which is approved by the Executive of the Association as affording a more businesslike and satisfactory basis for opticians' charges than did the circular letter to which we have referred.

Conference with the N.A.O.

A conference has taken place between Mr. A. Hershberg and Mr. Moevius (representing the National Association of Opticians), and Mr. P. Rockliff and Mr. C. W. Webb (representing the National Insurance Beneficent Society), at which the following scale, in accordance with a decision of the Council of the N.A.O., was agreed upon.

For work done for the N.I.B.S., members of the N.A.O. shall accept (*a*) 5s. for professional services including sight-testing; (*b*) 2s. 6d., for professional services where prescription brought to optician and no test required; (*c*) prime cost of article supplied as per standard prescription price list of any reputable wholesale firm. N.I.B.S. to place business with members of the N.A.O. on this basis without pledging themselves solely to members thereof. Remuneration for professional services under (*a*) and (*b*) to cover more than one pair of glasses if required and ordered at same time.

It is understood that about sixty "approved societies" are under the charge of the National Insurance Beneficent Society, and

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Seven Styles

now made in

"OCENTRIC" EYEGLASSES

BRITISH MADE.



A Distinctive Model for Each Individual Taste.

RIMLESS MOUNTS & FRAMES. G.F. & SOLID GOLD.

0 series Short Plaquets Regular pattern
100 „ Normal Plaquets Regular Pattern
200 „ Long Plaquets Regular Pattern
300 „ For Centrally Drilled Lenses
(BENT UP PLAQUET ENDS.)
400 „ For Centrally Drilled Lenses
(CLAMPS ATTACHED BY SHORT BRACKET.)
700 „ For Centrally Drilled Lenses
(SWAN NECK BRACKETS.)
800 „ Regular Pattern with Double Straps

SAMPLES and PRICES WILLINGLY ON APPLICATION.

The British Ocentric Optical Co., Ltd.,

Wholesale and Manufacturing Opticians,

12 & 13, EAGLE STREET, SOUTHAMPTON ROW,

LONDON, W.C. 1

Telegrams—Ocentricco, Westcent, London. *'Phone—Holborn 560*

Cables—Ocentricco, London.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

DUPAUL, YOUNG OPTICAL CO.,

SOUTHBRIDGE, MASS., U.S.A.

The "ONLIWON" GOLD FILLED INNER RIM ZYLO FRAME.



WE claim we have the ONLY ONE of this class of frame that is scientifically and mechanically perfect in construction.

The most important feature of the "ONLIWON" FRAME is, the way the outer Zylo rim is drawn and closed over the gold filled inner metal rim by a mechanical process known as "crimping," which means curling, turning, drawing. pressing, squeezing. Burnishing one over the other by heat and pressure, thus firmly clamping it securely to the now imbedded inner metal rim, without screws, rivets or clamps.

"ONLIWON" Frames can be formed to any desired shape of eye without the two rims separating.

"ONLIWON" Frames have thin, inconspicuous rims and are not clumsy or showy.

All our Bridges have a Rounded Base at Shank.

Which absolutely prevents the Breaking or cracking of the gold shell of the filled metal during the process of shaping them to size, which is distinctly a Dupaul, Young Optical Company feature on all our frames.

The special KANTFEEL TEMPLES used on "ONLIWON" FRAMES are so made as to almost totally eliminate their breaking at the end-piece.

To be obtained from all Wholesale Optical Houses.

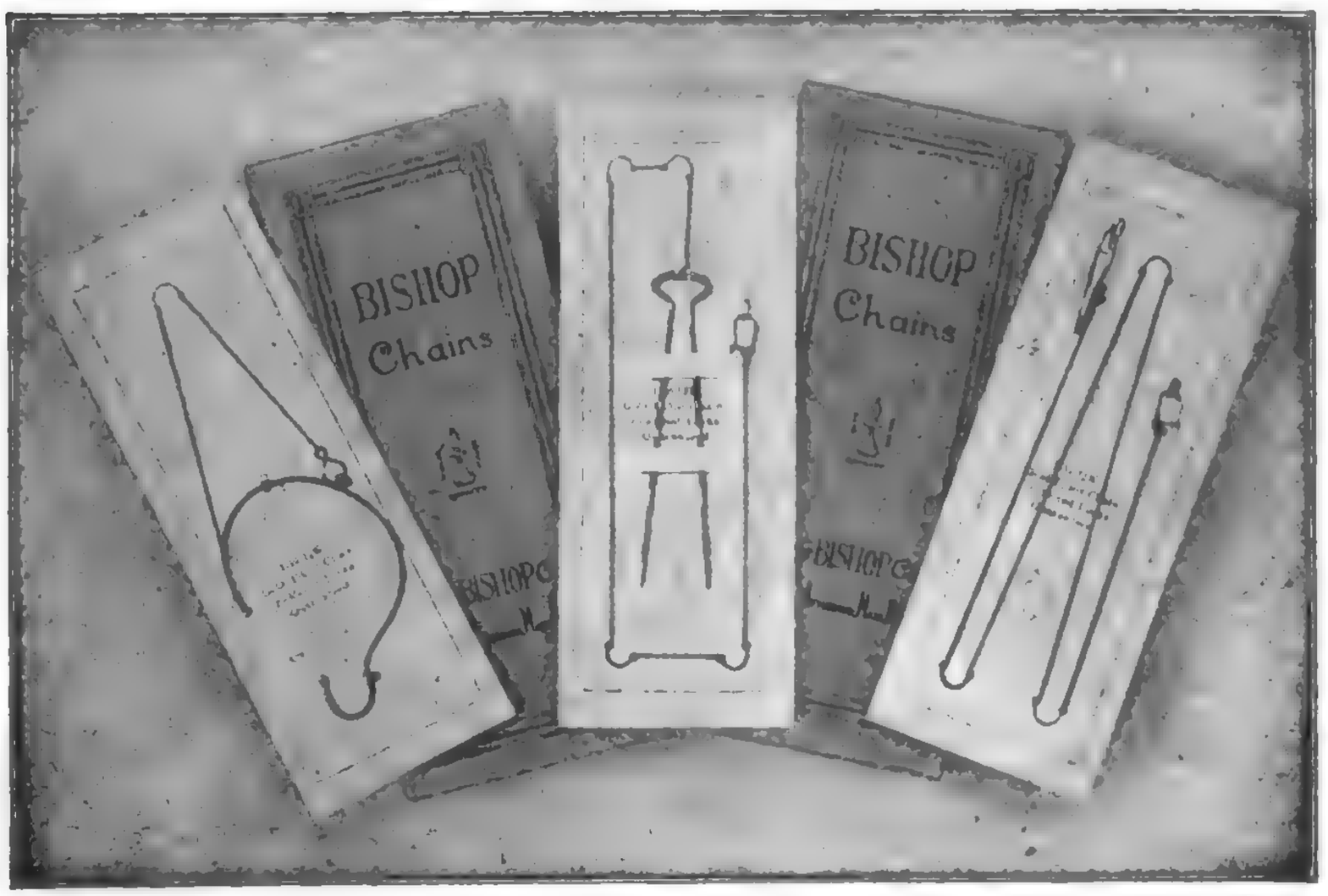
LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE BISHOP CO., INC.,
NORTH ATTLEBORO, MASS., U.S.A.



EYEGLASS CHAINS

In Gold and Gold Filled

GUARANTEED QUALITY, BEST WORKMANSHIP,
PERFECT COLOUR, SOLDERED LINKS.

ALSO

SILK EYEGLASS & MONOCLE RIBBONS

With Gold Filled snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

NOVEMBER EXAMINATION RESULTS: MANY SUCCESSES!

Your Opportunity to

QUALIFY IN OPTICS

PRACTICAL WORK. Students taking the Course may receive personal tuition in the practical work AT ANY TIME DURING THE COURSE.

Please read these extracts received from some of the students who passed the recent examinations.

"It is a great pleasure to me to feel I have surmounted this as studying after the worries of business is, as you know, very distasteful and hard work.

I wish to express my grateful thanks to you for your kind help and patience, and say how much I have appreciated **the excellent way in which your lessons are described. The clearness in which the knotty points are explained is particularly noticeable to one who has experienced other postal courses.**

J. B. SIMMONS."

"Notification has reached me to-day that I have passed the S.M.C. examination. I want to thank you very much for **careful coaching and straightening out of difficulties.** Besides the qualification, the Course has been a **very valuable refresher as to methods &c.**, and quite worth while from this standpoint only.

R. G. NEAVE."

"I would like to take this opportunity of saying that owing to **your very lucid course and the painstaking manner in which you have helped me** over the various difficulties that I experienced while under your tuition. I was able to negotiate this somewhat difficult examination.

A. B. BARNARD."

Each Student receives Thorough Tuition, Personal Guidance and Individual Interest throughout the Course.

Expert Tuition by Correspondence for the SIGHT-TESTING DIPLOMAS of the Worshipful Company of Spectacle Makers (F.S.M.C.), or the British Optical Association (D.B.O.A.).

Write for full particulars—

C. A. SCURR, M.P.S., F.S.M.C., F.I.O., etc.,

64, High Street - - - - BARNET.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

that the above scheme, which is accepted by the joint secretaries, Messrs. Rockliff and Cantor, is to be recommended to the said societies for adoption. The National Association of Opticians believes that by thus going on a panel of opticians on a purely professional basis, at a fee for services rendered for this class of work, there would be less difficulty in securing legal recognition when the next Sight-Testing Bill is brought before Parliament.

The Optical Society.

A meeting of this Society will be held at the Imperial College on Thursday, 8th December, when the following papers will be presented and discussed:—"The Physical Meaning of Spherical Aberration," by L. C. Martin, D.I.C., A.R.C.Sc., B.Sc.; "An Autostroboscope and an Incandescent Colour Top," by Dr. F. Lloyd Hopwood, A.R.C.Sc., F.Inst.P.; "Achromatic One Radius Doublet Eyepieces," by Lt.-Col. Gifford, F.R.A.S. A limited number of advance proofs of these papers will be available before the meeting; application for copies to be made to the Papers Secretary at 12, Oppidans Road, N.W.3. Fellows and members unable to be present at the meeting are invited to send written contributions to the discussion.

Committee Under Part II of the Safeguarding of Industries Act, 1921

The Board of Trade give notice that in exercise of the powers conferred upon them by Part II. of the Safeguarding of Industries Act, 1921, they have referred to a Committee (constituted for the purposes of that Part of the Act and consisting of:—Sir William Ashley, Ph.D. (Chairman), Mr. J. Arthur Aiton, C.B.E., Sir Thomas W. Allen, Sir John N. Barron, Bt., and Mr. F. R. Davenport) a complaint by the British Flint Glass Manufacturers' Association and the National Flint Glassmakers' Society, that articles of domestic glassware, illuminating glassware, and mounting glassware, manufactured in Germany and Czecho-Slovakia are being sold or offered for sale in the United Kingdom at prices which by reason of depreciation in the value in relation to sterling of the currency of the above named foreign countries are below the prices at which similar goods can be profitably manufactured in the United Kingdom, and that by reason thereof employment in the glass industry in the United Kingdom is being or is likely to be seriously affected. The Committee are directed after ascertaining the facts to report to the President of the Board of Trade (*a*) whether the conditions specified in Section 2 sub-section (1) of the Safeguarding of Industries Act, 1921, are fulfilled; (*b*) on the effect which the imposition of a duty under Part II. of the Act on goods of the class or description covered by the complaint would exert on employment in any other industry, being an industry using goods of that class or description as material; and (*c*) whether in the opinion of the Committee production in the industry manufacturing similar goods in the United Kingdom is being carried on with reasonable efficiency and economy.

The Committee propose to hold their first sitting for the taking of evidence at 2.30 p.m., on Monday, the 12th December, 1921, at the Hotel Windsor, Victoria Street, London, S.W.1. The Secretary to the Committee is Mr. W. G. Fergusson, Board of Trade, Great George Street, London, S.W.1., to whom all communications should be addressed.

"The Hellephone."

It is commonly supposed (says the 'Daily Express') that no mere mortal institution can be both omniscient and omnipotent. Quite wrong. The Telephone Department is both. It knows how many calls the subscriber has had. It knows how many wrong numbers he has not had. It knows. It knows. Should the subscriber question the omniscience, let him beware the omnipotence. Can he argue? Can he refuse to pay any claim? Yes. He can argue because it makes no difference. But he must pay. Let him withhold as much as 1½d. and he ceases as if by magic to have a telephone. Of course, he does. So he should. Otherwise what is the use of having a Government monopoly? No other institution could hope to combine in itself all the qualities of incompetence, inaccuracy, extravagance, and extortion. The world needs an example of the benefits of State control. It has it.

A Case in Point.

Following on the above note, Messrs. Baroux & Bion, Ltd., the well-known optical instrument makers (2, Tower Royal, E.C.), wrote to the 'Daily Express' as below:—

"In view of your comments recently on telephone charges, you may be interested to know that the department rendered us an account for the quarter ended September 30th,

Digitized by Google Original from THE OHIO STATE UNIVERSITY

charging us with 1,168 calls. We complained bitterly, and asked them to arrange to move the instrument and cancel the agreement as soon as possible. They apologised, and stated a mistake had been made—the account should have been for 293 calls!"

The Northampton Institute.

The Annual Prize Distribution and Students' Conversazione will be held at the Northampton Polytechnic Institute this (Friday) evening. The Rt. Hon. Lord Southwark, P.C., will distribute the prizes and certificates. The Conversazione for members and students will be continued to-morrow, when the building will be thrown open to the whole of the members and students and their friends. There will be an organ recital, promenade concert and dance to-morrow evening.

Canadian Exhibition of Scientific Apparatus.

An exhibition is to be held in Toronto from 27th to 31st December in connection with the annual meeting of the American Association for the Advancement of Science, and will be restricted to apparatus, products or scientific works of definite interest and appeal to scientists, the scientific staffs of Universities, government and industrial laboratories, etc. It is understood that no charge will be made for space. It should be particularly noted that exhibits will be limited to apparatus having a definite scientific interest or of a highly improved or novel character. The members of the Association are familiar with ordinary types of apparatus and such will not be eligible for exhibition. Recent scientific publications however, excluding elementary text-books, may be exhibited. The membership of the Association is said to be 12,000, so that the exhibition will presumably afford a good opportunity for bringing apparatus to the notice of a large number of American scientists. All communications should be addressed to Mr. Westman, Secretary, Committee-in-Charge of Exhibits (A.A.A.S.), 57, Queen Street West, Toronto. Arrangements are being made whereby United Kingdom firms without local agents may, if they desire, obtain the services at a comparatively small expense of a responsible person to clear their exhibits from Customs and unpack and mount them on stands. The Department of Overseas Trade (35, Old Queen Street, S.W.1), will supply such further information as it has available on request.

How to Polish an All-Shelltex frame on Repairs or as Service.

Some of our customers—says an editorial in the 'Shur-on Chronicle'—have written asking how, when a frame has been misused and a temple replacement becomes necessary, the file markings can be removed and the frame polished up.

"And a great many people in the trade and profession have seen the wisdom of polishing for their patrons many of the frames that come in for minor adjustment. This is a courtesy that is much appreciated; perhaps, you would like to extend this courtesy to your patrons. Here's how it's done:

"Make a cloth buff 6 inches in diameter and about ½ inch thick, to be used on your small power wheel, as follows:—Cut some pieces of cotton cloth in circles about 6 inches in diameter and some about 2 inches in diameter, lay them on top of each other, first two of the 6 inch and then one of the 2 inch, then two of the 6 inch and one of the 2 inch, and so on until when under pressure the wheel made is about ½ inch thick. Screw this on to your polishing head, take some FFF pumice stone, damp it and hold it on the wheel while in motion; then hold the part of the frame to be polished on the wheel until well finished, after which, use another buff exactly as described above, and on this use a small amount of Tripoli, or any other kind of metal polish, and do the finishing touches with this. Our Superintendent advises us that with very little experience you will be able to get a wonderful polish on the Shelltex frame."

A Lecture by Dr. Stopford.

At Manchester on the 7th inst., in the Lecture Theatre at the Medical School, Prof. J. S. D. Stopford, M.D., will give an address under the auspices of the British Optical Association on "The Visual Pathway from the Eye to the Cerebral Cortex." Tickets (price 2s. 6d.), are to be had from Mr. W. B. Barker, 34, King Street, Manchester.

A thick fog enveloped the football ground at Lea Bridge Road on Saturday, November 26th, and after 30 minutes' play the match between Bondwell F.C. (C. W. Dixey & Son) and St. Andrew's Institute (Cricklewood) F.C. had to be abandoned. On Saturday, December 3rd, the "Bees" oppose Cromwell Athletic F.C. away at Dalgarno Gardens, North Kensington. Supporters are cordially invited.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

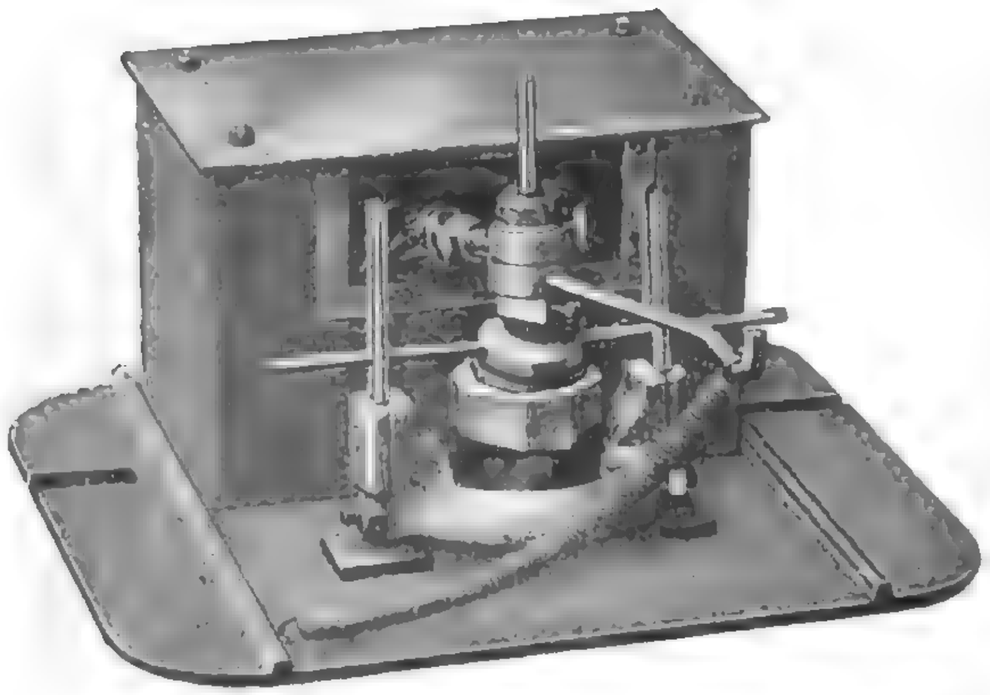
"SOMCO"

AUTO-SURFACING MACHINE.

PATENTED IN
GREAT BRITAIN
U.S.A.
FRANCE
GERMANY.

LONDON
MADE.

Ask for Quotations.



Requires Only 1/6 H.P.

TOOLS
GAUGES
SURFACING
SHOP EQUIPMENT
OPTICAL MACHINERY & INSTRUMENT REPAIRS.

SURGICAL & OPTICAL MFG., Co.,
22, Union Road,
Clapham, London, S.W.4

Rx

SANDRO LOWY

Optical Rx Specialist,

88, Goswell Road,

LONDON, E.C. 1

Telephone: CITY 304 (two lines)

Telegrams: SANOPTIC, LONDON.

Rx

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

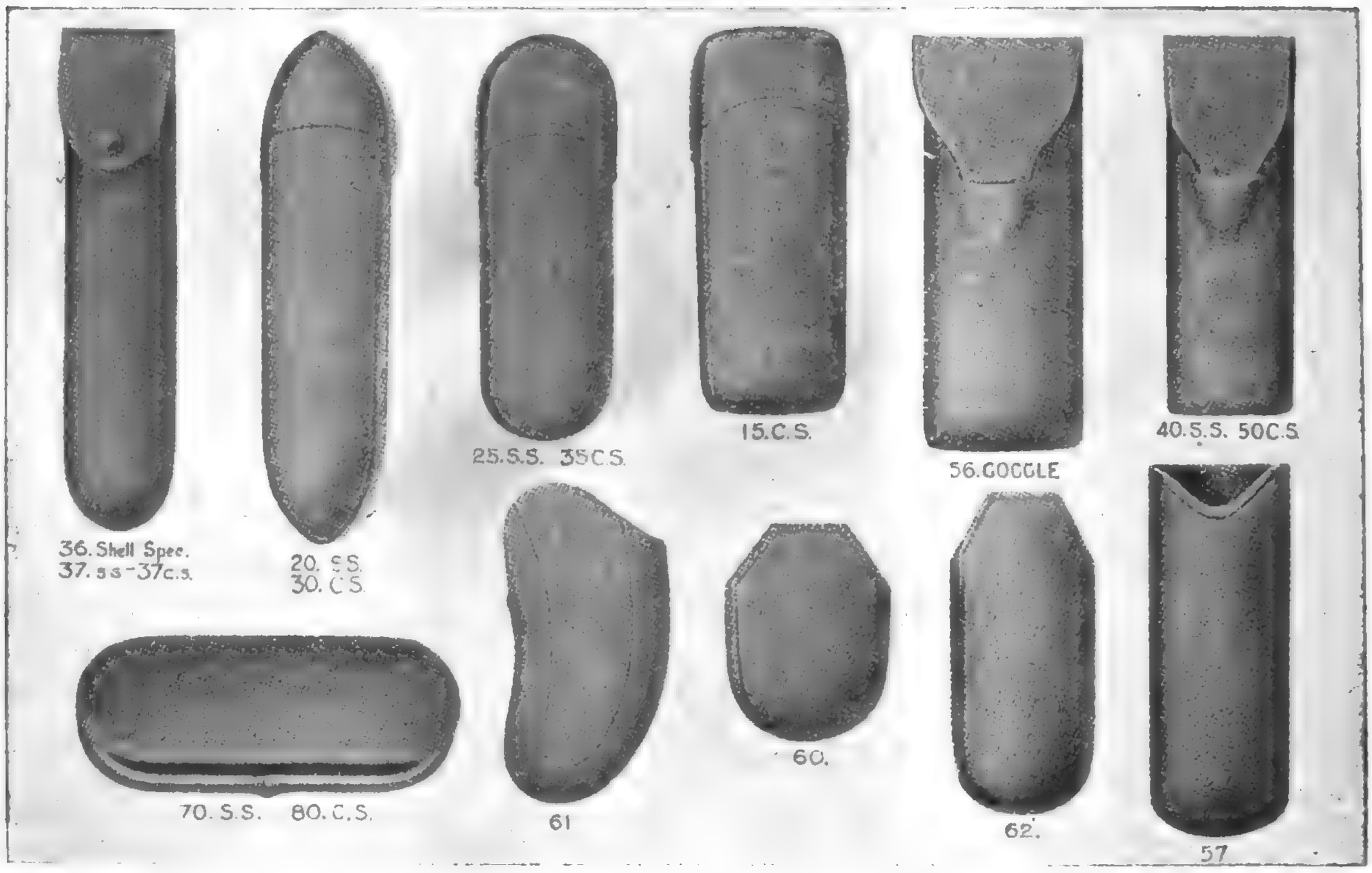
WHOLESALE TRADE ONLY.

W. Smythe & Co. Ltd.

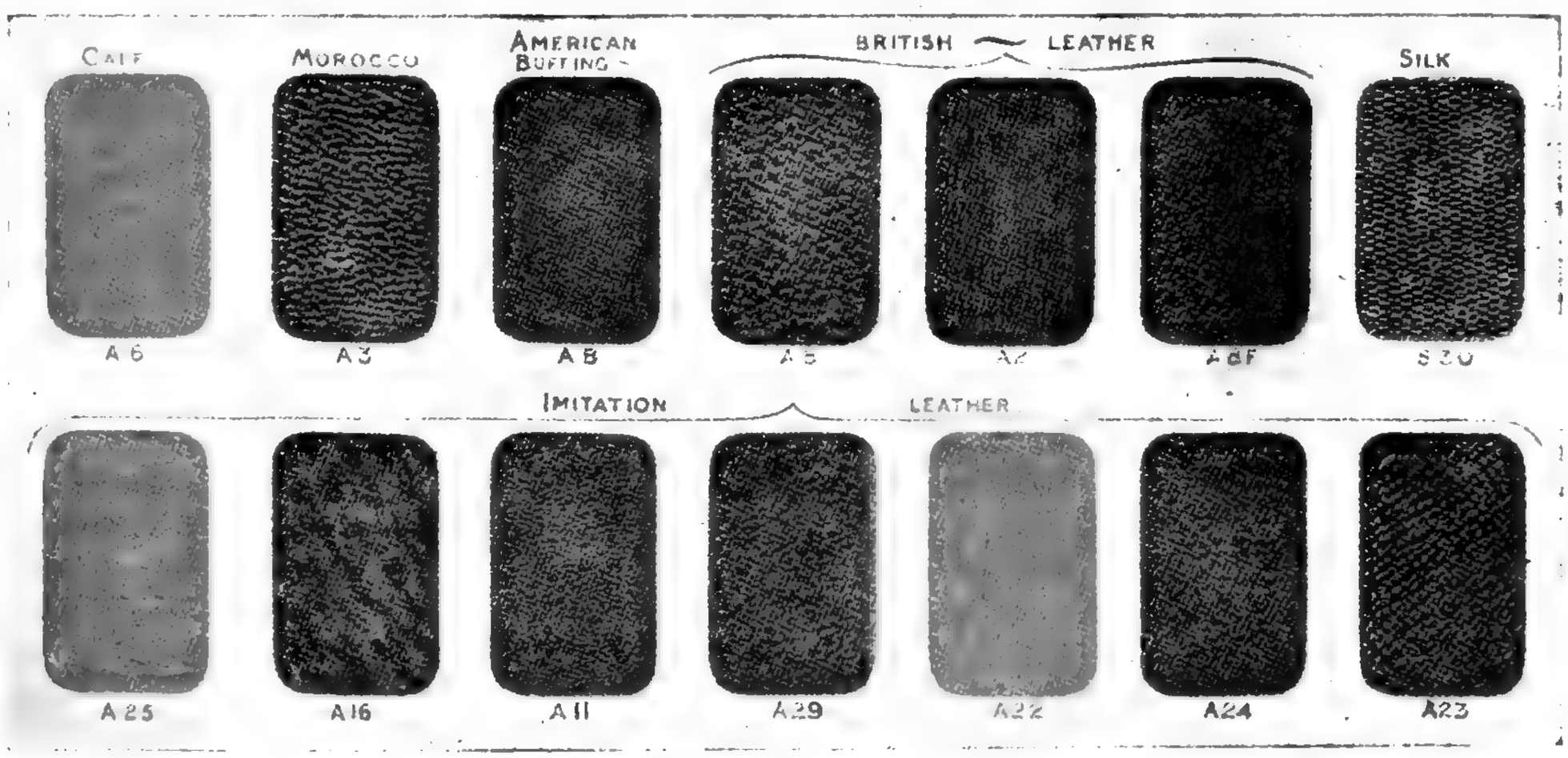
Head Office: 66 and 67, EDWARD ST. PARADE, **Birmingham**

Branch Works—HOCKLEY AND WALSALL.

Patent Optical Case Manufacturers



All Our Goods can be Covered with These Materials and Velvet.



Illustrations Half-size. Competitive Prices

Also Makers of Patent Spring Lid Cases "NOWATE" Write for List and Prices.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Ferrocerium and the other Pyrophoric Alloys.

It was in 1903 that Welsbach discovered that certain rare earth alloys, when rubbed with a file, emitted brilliant sparks, which were able to ignite combustible gases. A few years later it was found that the best results could be obtained by the admixture of 65 parts per 100 of iron. These alloys have an action, similar to that of flint and steel, but the spark can be produced more easily than with the ordinary tinder box of by-gone days.

The mixture of rare earths consists principally of cerium, lanthanum, didymium, neodymium praseodymium, and samarium. All these metals are white in sunlight; their ordinary colour is yellow and they oxidise with difficulty in air.

The mixture, which the Germans call "misch metal," possesses properties which vary according to the way in which the product is manufactured. One alloy, coming from a large chemical factory, is very malleable, while another, made by a plant working with an electric reduction method, is very hard and brittle. The fragility is attributed to the presence of silicon among the impurities.

While the original pyrophoric alloys, made by Welsbach contained about 40 parts per 100 of iron, the present day products contain only 15 per cent. iron, but about 2 per cent. bismuth or antimony is added in order to make the alloy hard. Silicon is found in all the ferrocerium alloys, partly because it is present in the original crude metal and partly because the crucibles used in the manufacture are made from clay. About 5 per cent. of copper is added by certain plants in order to produce a pyrophoric allow with not too high a melting point.

The pyrophoric property of these alloys is explained according to various theories. Some authorities say that this peculiar property is due to the presence of nitrides in the ferrocerium; others say that hyrides or suboxides are responsible for this action. No theory, however has been fully confirmed.

Certain of these alloys, made with mercury or platinum, which, however, possess no industrial interest, because of their price have been found to be explosive. A platinum alloy, containing 25 per cent. of the metal, has some of the well-known properties of the ordinary ferrocerium. The alloys made from zinc and cerium are particularly interesting because of their use in the illumination of the lamps used in mines. Those containing borium and cerium are also very useful for this purpose. A very fragile and easily pulverised alloy is obtained by the addition of 25 per cent. of aluminium or magnesium to the ferroceriums.

The lower grade pyrophoric alloys which contain a high percentage of carbides are very unstable. They must be protected from the air by a coating of oil; otherwise they will be oxidised very readily and speedily become totally useless.

The raw materials that are used in the manufacture of the ferrocerium alloys are obtained generally from the residues recovered in the process of making incandescent mantles from monazite sand. After the thorium has been extracted from these sands, there remains a residue of the oxides of the rare earths, which is known by the name of "misch." The majority of the plants making these alloys produce ferrocerium by the electrolysis of anhydrous chlorides of cerium, lanthanum, didymium, etc. An attempt has been made to use the fluorides of the metals of the cerium group, but poor results have been obtained thereby. Instead of a solid mass of the "misch" metal, as is obtained with the chlorides, a thick pasty product is procured which cannot be used.

The electrical process of manufacturing ferrocerium requires cheap current. The crucibles are generally made from graphite or clay and are provided with large iron cathodes. Sometimes iron crucibles are used which have double walls so that they can be cooled by means of a current of water.

In the early days of this industry, the small pyrophoric stones that were sold were just little fragments of metal weighing only a quarter to a fifth of a gram. They were more or less scientific curiosities.

In one of the tinder boxes on the market, the pyrophoric alloy is made in the form of a stick against which a small wheel made of hard steel rubs, the surface of which is striated like a file. When the wheel turns, a shower of sparks is formed, which are directed against a cotton wick soaked in benzine, causing it to ignite. Another type of tinder box has a rod of the pyrophoric alloy which is scratched by a sharp point of hard steel. The sparks impinge on a thread of asbestos, soaked in petrol. When the point is not in use, it is lodged in a small chamber in the apparatus.

The great market for the ferrocerium alloys is for the manufacture of automatic gas lighters, while in those countries of Europe where the match industry is a State monopoly, its principal consumption is in the manufacture of tinder boxes.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Radiations, Illumination and Colours.*

By Dr. MAX COQUE, B.Sc.

II.—ILLUMINATION.

When light falls on a surface, that surface is said to be illuminated and it must be understood from the outset that the illumination merely depends on the quantity of light falling and has nothing to do with the colour or the reflecting power of the surface exactly as rain fall is independent of the nature of the soil. When rain falls on an absorbing soil it quickly disappears whereas water stands on an inpermeable soil. In the same way, when light falls on a dark coloured surface, it is more or less absorbed or wasted but the same amount of light falling on a light or a white surface will give rise to the sensation of intense illumination. The brightness resulting from illumination is often called luminosity.

Illumination as we have defined it consists of two factors namely the illuminating power or candle power of the source or sources of light used and the distance at which this source is placed. The illumination produced by a source of light the power of which is 1 candle at a distance of 1 foot is the recognised unit in England and America and is termed the "candle foot" it has been suggested by Sugg about 50 years ago. During the last few years, the term foot-candle has been proposed. Either name is unfortunate because, unlike all other compound units, such as the foot-pound, the quantity in question is not the product of a candle power by the distance, but is a quotient in which the dividend is a candle power and the divisor is as we shall see presently the square of a length. The expression foot-candle is perhaps more logical than the other for twice the illumination of one foot candle becomes two foot candles and the candles appear to be multiplied which is not so misleading as two candle-feet where the candle remains single and the foot becomes plural.

On the continent, the unit of illumination is the bougie meter or lux; it is the illumination produced on a surface by an international bougie placed at a distance of 1 meter, this distance being measured on the normal to the surface.

We have said just now that illumination depends on the illumination power of this source and on the distance. The variation of illumination when the distance varies is governed by the well-known law of inverse squares, according to which the illumination varies in inverse proportion to the square of the distance. It follows that if we have a source of light the illuminating power of which is P and that source is placed at a distance d from a surface, the distance being measured along the perpendicular drawn from the source to the surface, the illumination I at the point on the surface where the perpendicular meets the surface itself is expressed by $I = P/d^2$.

If P is expressed in candles and d is feet, the illumination I is obtained in foot candles; if P is expressed in terms of the international bougie, and d is meters, then I is obtained in bougie-meters or luxes. Thus, a source the candle-power of which is 16 produces at a distance of 8 feet an illumination of $16/8^2$ or 16/64 or 0.25 foot-candle.

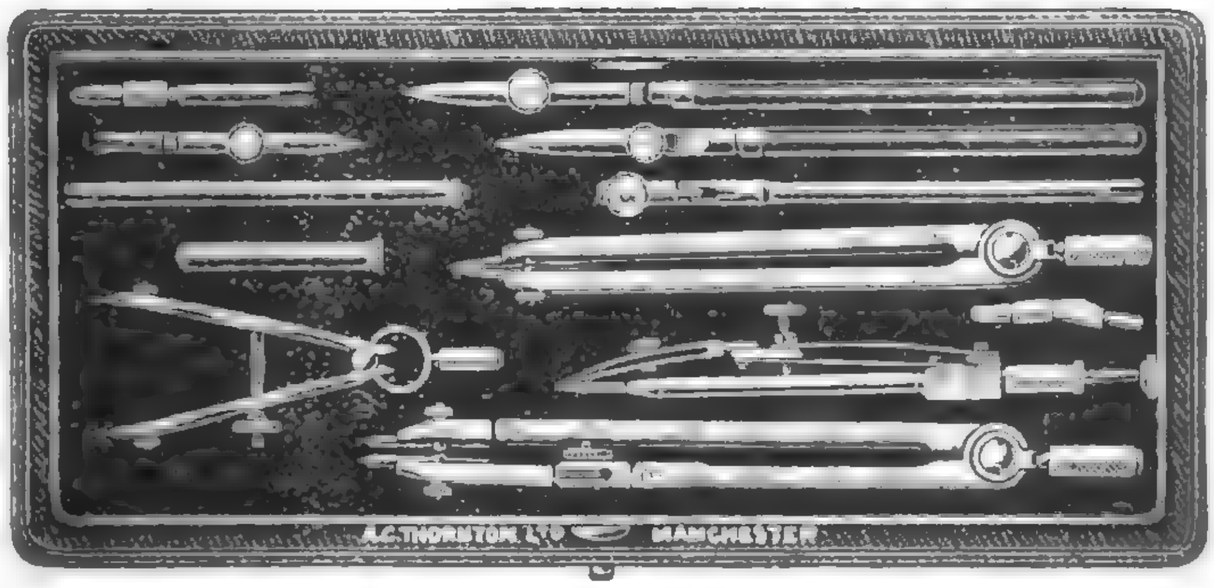
Strictly speaking the law of inverse squares only applies where the source of light is punctiform. In practice most of our sources of light have an appreciable area, all the elements of which may not be identical from the point of view of the amount of light they emit and in any case are not all at the same distance from the point on the surface for which the illumination is calculated. In reality, however, provided that the dimensions of the source of light used be small as compared to the distance which separates the source from the surface, the above formula applies with sufficient accuracy if we regard P as the illuminating power of the whole source and d as being the mean distance of the source from the surface. Calculations show that the error involved is below 3 per cent. if the distance d is five times the maximum dimensions of the source and falls to 1.5 per cent. if the distance d is twenty-five times the maximum dimensions of the source. Such an error is, therefore, negligible in practice, at least in the circumstances generally obtaining in photometric work.

It must be understood, however, that the above rule only holds good when the illuminated surface directly faces the source of light. If the surface is inclined to the direction of the rays of light, the illumination will diminish in proportion as the projected area of the surface diminishes when viewed from the source of light. It is an established convention amongst writers on Optics (but it is only

*Continued from page 217.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

BRITISH MADE DRAWING INSTRUMENTS



Pocket case of Show Instruments, from 18/9 each.

SPECIAL TERMS TO THE TRADE.

Produced in our Factory at Manchester.

A. G. THORNTON, LTD.

Contractors to the British, Colonial, and other Governments.

PARAGON WORKS,
20, KING ST., WEST,
MANCHESTER.

Elliott Optical Co.,

104 & 105 GT. SAFFRON HILL,
LONDON, E.C.1

TRADE EC MARK.

There is no Better House for

Rx Work.

RXS. RETURNED PROMPTLY, ACCURATELY DISPENSED and at REASONABLE PRICES.

Complete Outfit of Rx Stationery supplied, Free of Charge.

The Mark Dacol *of Distinction*

Only High Grade and High Quality

BINOCULARS

have this mark.

Full particulars from
DAVIES COLEMAN & Co., Ltd.,
45 & 46, Fetter Lane,
London, E.C.4

Telephone: HOLBORN 2597.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Style's the thing!



TO-DAY—the live, up-to-the-minute sight-testing optician is selling glasses on the basis of style. He's telling his patrons that they *can* wear their Shur-on glasses for tennis or horseback riding; they *can* wear their Shelltex rimmed spectacles with an evening gown, but it isn't the proper thing. The proper thing is to have the glasses fit the occasion.

The proper thing is to have proper Shur-on glasses for reading, for evening wear, for street wear and for sports.

In the Shur-on line, which comprises more than 996 different styles and types of eyeglasses, spectacles and cases ("Quality Beyond Question" since 1864), the optician has the widest possible range of dependable optical goods to select from. Be critical, say "SHUR-ON" to your wholesaler.

Shur-on Optical Co.,

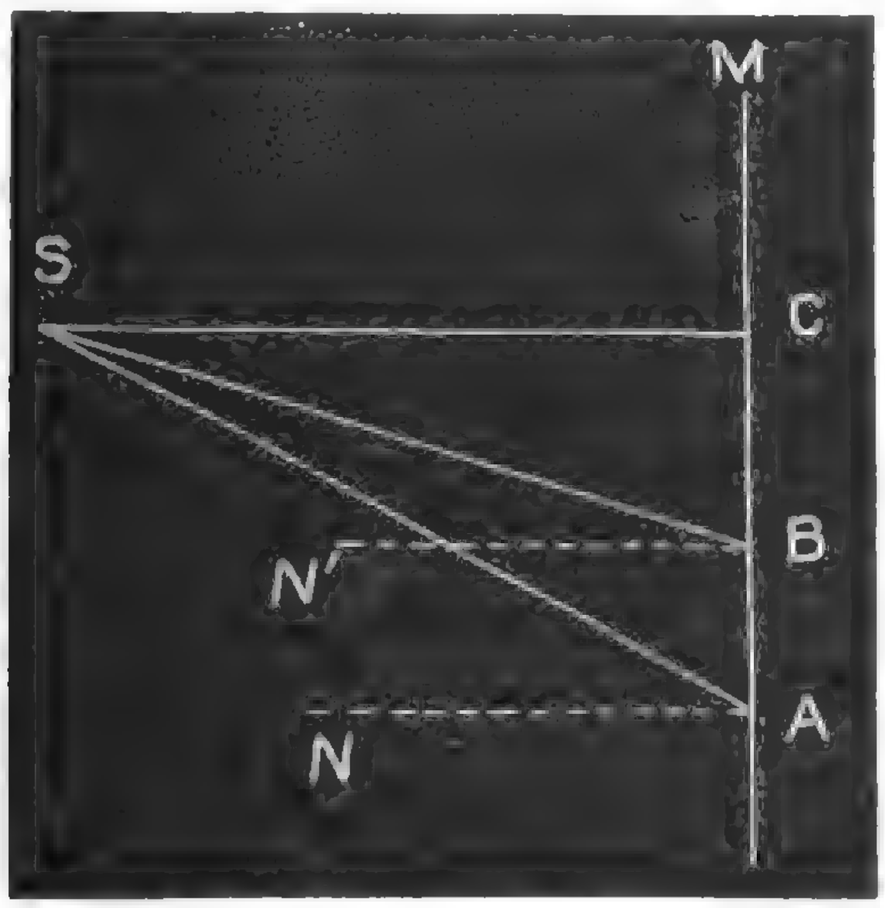
Rochester, N.Y. U.S.A.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

a convention) that the inclination between a ray and the perpendicular to the surface this ray strikes shall be called the angle of incidence and the law governing the variation of illumination when the angle of incidence varies, may be expressed as follows. The illumination due to a source of light at any point on a surface varies directly as the cosine of the angle of incidence, this angle being, as stated above, the angle formed by the normal to the surface at the point considered on one hand and the line joining the source to the point considered on the other hand.

The above law is known as the law of the Cosine or Lambert's law, enables us to express numerically the illumination at any point on a surface M by a source of light, the illuminating power of which is P. Thus, suppose the source S, fig. 1, the illuminating



power of which is represented by P be placed in front of a vertical wall M. The illumination at the point A is directly proportional to the power P, inversely proportional to the square of the distance SA and directly proportional to the cosine of the angle of incidence SAN, AN being the normal to the surface at the point A. It follows that the illumination at A is P cos SAN/SA². If we consider the illumination at B, its value will be given by P cos SBN'/SB² and finally if we consider the point C, the foot of the perpendicular drawn from the source S to the wall, the angle of incidence is now nil and as the cosine of an angle nil is unity, the value of the illumination at C is reduced to P/CS² as we have already seen.

In ordinary circumstances and except in exceptional cases, we have to look at illuminated surfaces and not directly at luminous bodies. It follows that from the point of view of ocular hygiene, we have mainly to consider illumination whichever way it is produced. The knowledge of the illuminating power of a source is certainly useful to enable us to find out how a given illumination can be obtained, and besides, it has a great importance from the economical point of view since the price of a given illumination in given circumstances depends in the illuminating power of the source and the cost involved in the use of that source in the unit of time.

We shall see presently though, that, from another standpoint, it is not indifferent that a given illumination power be supplied by a source of any size and that it is useful to consider the illuminating power per unit of surface, which is obtained by dividing the illuminating power by the area of the source. This quantity which is generally expressed in candles or in bougies by square cms. has been called the intrinsic power of the source or its specific illuminating power, by analogy with the specific weight (or weight of the unit of volume) specific heat, etc.

Various luminous bodies, looked at directly generally give us the sensation of various colourations. This may be due to the fact that the luminous body considered emits radiations of a fixed wave-length or at least that one of the radiations emitted has an intensity so much greater than that of the others that, practically, the latter may be neglected. Such is for instance the case of a sodium lamp which emits almost exclusively radiations having the wave-length corresponding to the line D of the spectrum and giving the sensation of yellow. Sources of this kind are said to be monochromatic and their spectrum is reduced to a single coloured band.

Light Sources in Practice.

Most of the luminous sources used in practice present, however a different case; they give a visible spectrum which, starting from red, extends more or less towards the violet. These sources emit, therefore, radiations of different wave-length which, if they reached the eye separately would give rise to sensations of different colours. But we know that when such a heterogeneous bundle of rays strikes the eye, we have the sensation of a single colour: we do not analyse the elements constituting the resulting sensation and the resultant colour depends upon the extent of the spectrum and the relative intensity of its different parts.

The whole of the radiations emitted by the sun give, on reaching our eye, the sensation

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

of white, and if the spectrum due to a certain source is more or less shortened on the violet side, the resulting sensation is that of a yellowish or orange or red colour, according to the extent to which the spectrum is shortened.

Generally speaking the range of visible radiations given by a source depends on the temperature of the luminous body. When the temperature of a body is raised gradually, this body only emits at first infra red or calorific radiations; then as the temperature increases to a value which for all bodies, is included between about 400 and 500° C red radiations, *i.e.*, the least refrangible radiations of the visible spectrum begin to appear; the body becomes visible or luminous. If the temperature is further increased, a double effect is produced: new radiations of a greater refrangibility are gradually emitted in addition to the previous ones, so that the spectrum originally reduced to red, extends gradually towards violet and at the same time, the intensity of the radiations increases.

These two modifications which alter the composition of the radiations emitted produce the variation in coloration and in luminosity.

Normally, at a fixed temperature for each body, which according to Draper is in the neighbourhood of 1100° C., the spectrum extends to the extreme limit of visibility on the violet side and the source of light then emits white light. If the temperature is still further increased, ultra-violet radiations appear and the spectrum extends in this direction in proportion to the increase of temperature. But these ultra-violet radiations do not affect the colour of the light emitted since, as we have seen, they do not reach the retina at least, not in the state of ultra-violet radiations. For all that, these ultra-violet radiations are important from the hygienic point of view: hence, the interest there is in determining the proportion in which they enter in various artificial lights: we shall revert to this point later on.

We might remark at this stage that light or more generally radiations corresponding to the wave-lengths observed in the spectrum, can be produced without the increase of temperature stated just now. We have already seen that those substances which are termed fluorescent have the property of emitting visible radiations when invisible ultra-violet waves fall upon them. This phenomenon is only one of a number of kindred phenomena generally classified under the name of Luminescence: this name is applied to all those cases in which a body is caused to give out light without having been raised to the high temperature that would correspond to the ordinary emission of light. The luminescence in which the emission of *cold light* is due to chemical action is shown at its best in the case of phosphorus which shines in the dark when slowly oxidising in moist air. If a stick of phosphorus is used to write on a sheet of ground glass that has been dipped into warm water, the writing will be visible in the dark in the form of a pale blue glimmer. In a few minutes, the film of phosphorus forming the letters will have oxidised itself completely and the emission of light will be at an end.

[To be continued.]

Attention is drawn to the advertisement in our columns this week of the India Store Department, inviting tenders for the supply of prismatic binoculars. Forms of tender are to be had on application to the Department; and it is required that tenders shall be delivered not later than 2 p.m. on Thursday, the 15th inst.

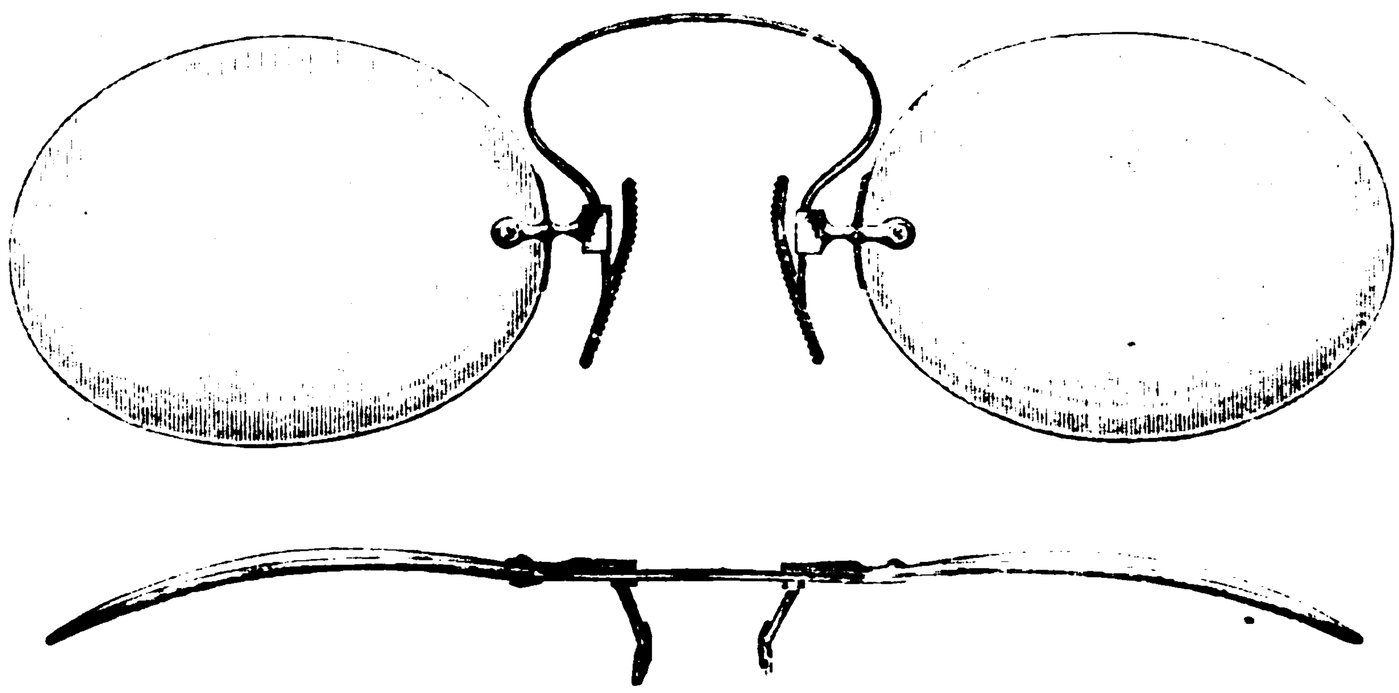
New Companies.

Newton, Roberts & Co., Ltd.—Private Company. Capital, £2,000 in £1 shares. To acquire the business carried on at 10, Great Pulteney Street, W., as "C. E. Newton," to adopt an agreement with J. A. Watts, C. E. Thirkettle and Mabel Watts, and to carry on the business of manufacturing photographic apparatus and chemical, optical, cinematographic, electrical, scientific and mechanical instruments, etc. The subscribers (each with one share) are:—A. Rothery, 12, Montana Road, Tooting Bec., S.W.17; J. A. Watts, 51, Downhills Park Road, Philip Lane, Tottenham; and W. G. Roberts, 5, Nelson Terrace, N.1. The directors are to be appointed by the subscribers. Qualification (except first directors), £100. Solicitors: Swann, Hardman & Co., 10, Norfolk Street, Strand, W.C.2.

British Medical and Scientific Glassware Co., Ltd.—Private Company. Capital £1,000 in £1 shares. To carry on business as indicated by the title and that of manufacturers of, agents for and dealers in surgical instruments, medical appliances, scientific apparatus, etc. The first directors are:—W. A. Horrox, Hazelbank, Durfold Hill, Warnham, Sussex; C. Newman, 13, Polworth Road, Streatham, S.W.; J. J. Young, The Nook, Bushey, Herts; and J. Dickinson, 125, High Street, Putney Common, S.W. Qualification: £25. Remuneration as fixed by the company. Registered office: 15, Bateman Street, Dean Street, Soho, W.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Lyon's
"Standard" Offset Mounts
For Accurate Fitting and Exact Alignment
Optically Perfect.



No. 893 GOLD No. 1293 GOLD FILLED.

Smart in Appearance and Comfortable to Wear.
Easily Adjusted.

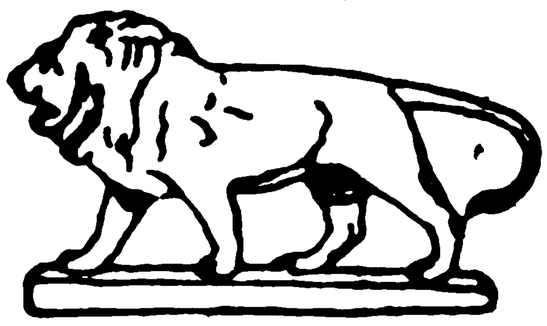
FULL STOCK OF STUDS, SPRINGS AND GUARDS. FITTING SETS SUPPLIED.

F. H. C. Lyon,

Wholesale and Manufacturing Optician,

59-61, Hatton Garden, London, E.C.1

Telegraphic Address:
CYLTORREXO, SMITH, LONDON.



Regd. Trade Mark.

Telephone No.:
HOLBORN 1203.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Don't tolerate it!!

If in your opinion your work is not being returned as fast as might be —just try the Willesden Way.

▪ ▪ ▪ ▪

Address your next box of jobbing to W.O.W.—see what they can do.

▪ ▪ ▪ ▪

You have the Willesden guarantee for quality—all the time, and the difference in price is in your favour.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY:
DUDDEN HILL LANE, N.W.10

FINEST ROUGH CYLINDER BLANKS,

Also good 2nd Selection
A very attractive proposition for Export and cheaper work.

CHANCE'S GLASS USED.

ACTUAL MANUFACTURERS
ASSOCIATED OPTICAL WORKS, Ld.
5, Queen's Buildings, London, W.1
Near Tottenham Court Road.
No Connection with any other Firm. Telephone: Museum 2216.

TO LENS MANUFACTURERS

For Disposal (In Perfect Condition)

1 12 Spindle Machine for Bi & Cyl. Lenses
1 20 „ „ „ Meniscus „
1 10 „ „ „ Deep Bi, Peris & Meniscus Lenses

Together with Blocks.

Full particulars on application to Box 5742, c/o "The Optician," 125, Fleet Street, E.C.4

Candidates for the Examination of the **Worshipful Company of Spectaclemakers** can always be certain of receiving the most thorough and painstaking preparation at

THE SCHOOL OF OPTICS, LTD.,

Under the direction of Mr. LIONEL LAURANCE (Official instructor to the Company) and Mr. H. OSCAR WOOD.

General Optics, Visual Optics and Sight Testing.

The percentage of successful students AT THE FIRST ATTEMPT is consistently high.

Correspondence Courses, Afternoon and Continuous Day Classes.

Particulars on application to—

2, GUILFORD PLACE, LONDON, W.C.1

Manufacture Mécanique de Lunetterie & d'Optique

LIZON & Cie. at Morez du Jura — France. —

Formed by the amalgamation of the old firms:—HENRI COLIN FILS
ALPHONSE BUSSOD-ORY ANDRE CAMELIN LES FILS LOUIS LIZON
LOUIS ARBEZ GUY BUFFARD EMILE MANDRILLON

EYEGLASSES & SPECTACLES high-class goods in any metals and materials, any supplies for fitting and repairing spect. (straight and cable temples)

Clips, Rimless, Fits-u (Rivets, Screws, Crowns, Springs), D Eyes Spect. Frames with Collapsible and Folding Gauze Cups. Motor Goggles.

Optical Lens Manufacturers—Wholesale Only.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

"You Cannot TRADE SQ MARK *Buy Better"*

STEVENS' QUALITY
Optical Goods

UNQUALIFIED approval meets this celebrated line wherever introduced.

WE are sole agents for the United Kingdom and can invariably supply your requirements from stock.

One Quality Only—The Best Made

1/10th 12ct. Gold Filled

Specialising in the Fingerpiece Mount

Send us your enquiries for
Spectacles and Eyeglasses—Frames and Mountings

Complete Catalogues on Application

H. WILLIAMSON Ltd.
Optical Section
87/89 GREAT SAFFRON HILL, LONDON, E.C.1

General Optical Supplies—Prescription and Repair Work—
Fittings and Instruments—Optical Machinery

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Optician's Cement is

'COAGULINE'

Makes permanent imperceptible joints, glass-clear and glass-hard. Unequalled for delicate repairs.

From Supply Houses or large size, post free, 1/2.
KAY Bros, Ld. Stockport

£1-10-0 MICROMETER for 3/6 each, reading 1/1000 of an inch 0-1" and 1-2", limited number. S. Starrett's partly finished, consisting of drop forge steel frame, finished, bored, engraved and figured barrel, hardened and ground anvil, rough bored thimble, rough machined steel screen 1/- extra, finished, threaded and hardened screen, postage 6d.
ERICSON, 61, ERITH ROAD, BELVEDERE, S.E.

DOING YOUR OWN EDGINGP
Write us for
UNCUT TORICS.
Remarkably Low Prices.
APEX OPTICAL Co., Kidderminster.

PERCY S. DE SAULLES.
Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES
Micro Cover Glasses, Glass Cells and Cavity Slips, etc.
The Platts, Amblecote, Stourbridge.

BAKER 244 HIGH HOLBORN LONDON
Estab. 1657
Do You Handle Kodaks?
The "Metron" Plate Adapters, if stocked, will mean a large Increase of Business.
PARTICULARS AND TERMS ON APPLICATION



OPTICAL BLOCKS
To illustrate all features of Optical Service. Write for lists.
CHEMISTS' DESIGN SERVICE
12 Humberstone Gate, LEICESTER.

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
C. G. DYMOND. M.I.Mech.E., F.I.C.P.A
W. P. THOMPSON & CO.,
12, CHURCH STREET, LIVERPOOL.
Chartered Patent Agents.
H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and ABRONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
ESTABLISHED 1876 TELEPHONE CITY 419

THE HIGH COMMISSIONER FOR INDIA is prepared to receive Tenders for the supply of:

BINOCULARS, Prismatic.

Forms of tender may be obtained from the Director-General, India Stores Department, Belvedere Road, Lambeth, S.E.1., and Tenders are to be delivered at that Office not later than TWO o'clock p.m. on Thursday, the 15th December, 1921.

T. RYAN, Director-General.

"BELL" PATTERN SEXTANTS.

Our attention having been called to the fact that our "Bell" pattern Sextant is an infringement of the Registered Design, No. 517155, owned by

MESSRS. HEATH & CO., LTD.,
NEW ELTHAM, LONDON, S.E.9.

we regret that we shall in future be unable to supply such Sextants as illustrated under design No. 210 of our recently issued Catalogue. We shall be glad, therefore, if our friends who have received a copy of our Catalogue will please consider this page as cancelled, and we are sorry for our transgression.

A. H. BENNETT & WARWICK,
Bexley Heath.

DIXON & HEMPENSTALL,
Wholesale and Manufacturing Opticians,
12, SUFFOLK STREET, DUBLIN.
Telegrams "Optics, Dublin."

The Optical Society.
President: Mr. R. S. WHIPPLE, M.I.E.E.
Vice-Presidents: Prof. FREDERIC J. CHESHIRE, C.B.E., Director of the Technical Optics Department of the Imperial College of Science and Technology, South Kensington; Sir HERBERT JACKSON, K.B.E., F.R.S.
Hon. Treasurer: Mr. I. G. AITCHISON, B.A., LL.D.
Hon. Secs.: Mr. L. C. MARTIN, B. Sc., Imperial College of Science and Technology, South Kensington S.W.7 and
Papers' Secretary: Mr. F. F. BRYSON, M.A., B.Sc.

The Society of Chemist-Opticians.
President: Mr. F. S. HORSEY
Vice-Presidents Mr. FOURACRE.
Hon. Secretary: Mr. J. HARCOMBE CUFF. Friern Barnet Rd. New Southgate, N. 11 Telephone Finchley
THE SUPPORT OF ALL CHEMIST-OPTICIANS IS EARNESTLY INVITED.

SPECTACLES & EYEGLASSES.
Their Forms, Mounting and Proper Adjustment
by R. J. PHILLIPS, M.D.
Fourth edition revised with 58 illustrations.
Price 6s. 6d. Post Free 7s.
THE HATTON PRESS, Ltd., 125, Fleet Street, London, E.C.4

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

L.O.C.

Pin your faith to
L.O.C. for all your
Rx Work and you
will have frequent
cause for self-
congratulation.

LONDON OPTICAL Co.,
Offices and Works:
344/354, GRAY'S INN RD., LONDON, W.C. 1
Factory—CROMER STREET, LONDON.
Branch—6, Rueide la Pepiniere, Paris. France.
Also at —2, Str-Bursei, Bucharest, Roumania.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d. per word: for replies under Box No. 2d. extra.
Address of Office must be calculated as six words.

TEST CASE, large Wellsworth, condition as new, also trial frame, Orthops test charts and instruments, to close Bankrupt's estate. Apply, Stevens & Champion, Auctioneers, Temple Row, Birmingham.

WANTED, a trial case. C. Winston, 32, Kirkgate, Bradford.

LENS Surfacing machines. New. Half cost price. Marryat, Hatton Garden, London.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

WANTED. Small business or partnership on South Coast. F.B.O.A. Box 3507, c/o "The Optician," 125, Fleet Street, E.C.4.

FOR SALE. Old established optical business in main thoroughfare of Glasgow. Low rental. Apply, Box 3497, c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 8*

ASSISTANT, Qualified, wanted for sight-testing, knowledge of workshop, age about 25, London district. Send full particulars of experience, salary required and photo to Box 5765, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST, age 28, requires position with retail optician, awaiting result of B.O.A. examination. 6 years' sight-testing experience and thorough knowledge of photography. C.R., 76, Charlwood Street, Pimlico, S.W.

WANTED, young man, smart appearance, all-round worker, rimless fitting essential, good opportunities. Write, stating age and salary required to C. Winston, 32, Kirkgate, Bradford

REFRACTIONIST, used to working class trade, good retinoscopist and salesman, 20 years' experience, open to engagement. Optician, 49, Hazlewood Avenue, Newcastle-on-Tyne.

REFRACTIONIST, young lady, age 25, thoroughly experienced in all branches of sight-testing, desires position as assistant to sight-testing optician. Used to sole charge. Midlands preferred. Box 5773, c/o "The Optician," 125, Fleet Street, E.C.4.

LOCUM TENENS disengaged, capable and experienced refractionist, thoroughly reliable and practical workman, used to management. Excellent credentials. Box 5774, c/o "The "Optician," 125, Fleet Street, E.C.4.

QUALIFIED Opticians require manager and assistant, high class business. Give full particulars in first letter, stating wages. Apply, Box 5775, c/o "The Optician," 125, Fleet Street, E.C.4.

TORTOISESHELL worker requires berth. Good at general repairs, lorgnettes, spectacles, folders. District not essential. Box 5776, c/o "The Optician," 125, Fleet Street, E.C.4.

NOTICE.

J. WHEELER, 55, ST. JOHN STREET, OXFORD

wishes to announce that he has purchased the

ENTIRE STOCK OF THE BAY STATE OPTICAL CO.,

held by the Bank and will be
pleased to give his best attention to all customers.

By Order of the High Bailiff, Wandsworth County Court.

re The Lens Manufacturing Co.,

10a, TRINITY ROAD, BALHAM.

Close Balham High Road, and Station (L.B. & S.C.R.).

THE MACHINERY, PLANT & EFFECTS of an OPTICAL, GENERAL & MOTOR ENGINEERS & IRON FOUNDRY, comprising among other things:—

3 9″ & 1 9½″ S.S.S.C. LATHES COMPLETE; 8½″ S.C. GAP LATHE; 2 Super-Realm Lathes; PLANING MACHINE; 4 SENSITIVE DRILLING MACHINES; 2 Tool Grinding Machines; Power Hack Saw; 8 h.p. ELECTRIC MOTOR, Complete by Harding Churton; Pulleys, Shafting, Belting, Vices; 4-SPINDLE LENS SURFACING MACHINES; Moulding Boxes; 2 and 4 cwt. Ladles; 15cwt. CUPOLA & BLOWER; Optical, Toric, Smoothing, Cylinder and other Tools; &c., &c., and numerous other effects which

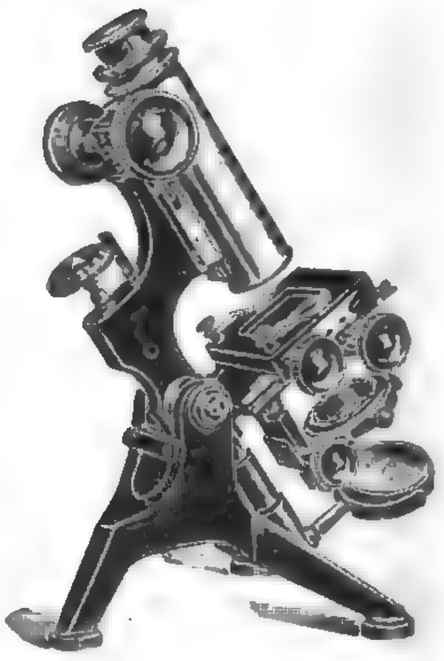
HUGH F. THOBURN

is instructed to sell on the premises as above on THURSDAY, 8th December, 1921, at 11.30 a.m. ON VIEW DAY PRIOR TO SALE. Catalogues of the Auctioneer, Kent House Station, Beckenham, Kent. 'Phone: Sydenham, 1529.

SELL WATSONS' BRITISH-MADE

MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,

313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1857.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

TRY KIRK BROTHERS WHOLESALE & MANUFACTURING OPTICIANS FOR

OPTICAL REQUIREMENTS OF EVERY DESCRIPTION.

SPECTACLES and EYEGLASS FRAMES
RIMLESS MOUNTINGS
REPAIR MATERIAL
EYEGLASS CHAINS

TORTOISESHELL, HORN, XYLO and SHELLITE FRAMES
LORGNETTES
CASES
MOTOR GOGGLES, etc.

UNCUT LENSES WHITE or CHANCE'S CROOKES GLASS

SPHERES, BI or PERIS
ROUGH CYLINDERS
PLANO CYLINDERS
SPHERO CYLINDERS

CEMENT SEGMENTS
MENISCUS
TORICS
ROUGH TORICS, etc.

OUR RX DEPARTMENT IS UNEQUALLED FOR PROMPTNESS & ACCURACY.

Telephone: HOLBORN 1620 (Private Exchange).

KIRK BROTHERS WHOLESALE & MANUFACTURING OPTICIANS

Telegrams: KIRKOREX, HOLB. LONDON.

36, GRAY'S INN ROAD, LONDON, W.C. 1

The Prefix is alright but what really counts is

THE SUFFIX

Crookes glass dates back to say 1913, and made by anyone is original and genuine, but it is important to remember that applies only to Sir Wm. Crookes A and B Glass. Since that date much water has flowed under London Bridge and Sir William only ceased his labours when he brought out his *Ultimate* Glass—the result of his long years of research. The only genuine Crookes Ultimate is made by—

SIR WILLIAM CROOKES ULTIMATE ANTI-GLARE GLASS CO., LTD.,
30, WIGMORE STREET, LONDON, W.

REMEMBER THE SUFFIX—ULTIMATE.

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,
DANDURAND BLDG., MONTREAL.
Cable "Optical" A.B.C. Code 5th. Edition.

BRITISH OPTICAL INSTITUTE, LTD.,
(College of Optics).

Complete Training for the Sight-Testing Optician.

Supplementary to the usual Daily Classes and Correspondence Courses, a series of Evening Classes is held, for those desirous of preparing themselves for any of the Optical Examinations.

A Course of Weekly Evening Lectures, and Demonstrations, for candidates for the F.B.O.A. Examination, and for post-graduates, has also been arranged.

Clinical Classes.

are held on two afternoons a week, and give Students the special advantage of meeting actual cases, generally of particular interest.

The whole work of the Institute is carried out under the supervision of the Principal, assisted by Mr. Geo. Colebrook, F.B.O.A., F.S.M.C., (Master's Prizeman).

For full particulars apply to:—The Principal, Dr. MAX COGUE, B.Sc., Fern Lodge, 20a, Grove Road, Brixton, S.W.9
Telephone: Brixton 677.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

***A*.—Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

WANTED for London office of lens manufacturer, young man with a knowledge of the wholesale trade to take charge of stock and call on customers. Apply, stating age, experience and wages required, to Box 5772, c/o "The Optician," 125, Fleet Street, E.C.4.

RETAIL or Wholesale position in London required by unqualified refractionist, 9 years' experience, including management of general optical trade. Good appearance and address, thoroughly reliable in every way. Studying for S.M.C., only reason for seeking change. Box 5771, c/o "The Optician," 125, Fleet Street, E.C.4.

SITUATION required by young lady with West End retail optician. Five years' experience with qualified optician, smart saleswoman, can neutralise, do small repairs and frame fitting. Reply, Box 5770, c/o "The Optician," 125, Fleet Street, E.C.4.

TORTOISESHELL frame maker wanted for Birmingham. Good wages and prospects for young man capable of taking charge. Box 5769, c/o "The Optician," 125, Fleet Street, E.C.4.

SOUND Refractionist, age 25, married, of good appearance and address, requires post. West End and provincial experience. "Sight," 47, Kenninghall Road, Clapton, E.5.

WANTED for large town in Yorkshire, assistant well up in testing and good salesman, also man to take management of small branch. Box 5768, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION as branch manager or first assistant required in London or suburbs. Passed S.M.C. examination excepting one subject, careful refractionist O. & S. methods. Can do all repairs, also edging and fitting. Good all-round knowledge, own test case, etc. Box 5767, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED Refractionist (F.S.M.C.), keen and energetic, age 33, good address and appearance, desires engagement. Careful tester, with clinical experience, London or near preferred. Apply, Box 5766, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. experienced reliable manager desires change. Careful and expert refractionist (O. & S. methods), frame fitter, etc. Can assure employer of integrity, and thorough service. Box 5762, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACER (all-round) seeks situation (male). Box 5764, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED opticians required. Good experience and address essential. Excellent progressive positions offered. South Coast. Apply, Box 5761, c/o "The Optician," 125, Fleet Street, E.C.4.

LADY, age 23, seeks re-engagement in optical trade, 3 years' wholesale and 3½ years' retail experience. Birmingham essential. Box 5760, c/o "The Optician, 125, Fleet Street, E.C.4.

EXPERIENCED lens worker requires situation. Thoroughly used to all first-class prescription work. R. Talbot, 151, Monument Road, Ladywood, Birmingham.

EXPERIENCED Man, has organising ability, requires situation, good references. Apply, Box 5759, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS Refractionist, D.B.O.A., F.S.M.C., thoroughly reliable and accurate, requires position as branch manager or first assistant. Is not afraid of work or responsibility. Write Box 5758, c/o "The Optician," 125, Fleet Street, E.C.4.

QUICK, First-class, reliable rimless fitter seeks situation. Moderate knowledge of rimless and bevel edging. 8 years' experience. Apply Box 5757, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, 18, requires position to gain further experience of sight-testing, knowledge of cameras and materials. Box 5763, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST, 40, long sight-testing experience, retinoscopy and ophthalmoscopy, good salesman, impressive manner, seeks engagement. Reply, Box 5749, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS fitter and surfacer requires situation (male), served apprenticeship. Box 5746, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED dispensing optician desires re-engagement as manager or assistant. Over 20 years' experience of high-class work with leading dispensing house. Capable salesman and fitter. Box 5744, c/o "The Optician," 125, Fleet Street, E.C.4.

SECOND YEAR Student at Northampton Polytechnic seeks situation with optician familiar with prescription work. P.V.T., 292, Lancaster Road, W.11.

GOOD All-round jobber required with experience in rimless glazing. Box 5743, c/o "The Optician," 125, Fleet Street, E.C.4.

MANAGER F.S.M.C., 35, tall and good address, married, desires appointment requiring ability and initiative. 20 years' sound all-round experience in London and provinces. Box 5756, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. (young) desires position with Manchester (or district) firm. First class experience and sound knowledge of practical work. Box 5754, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED by qualified optician, responsible position offering scope for accurate refraction, first-class salesmanship and energetic organising. In or near London. Box 5752, c/o "The Optician," 125, Fleet Street, E.C.4.

WATCHMAKER, improver, studying for S.M.C. exam. desires position with jeweller-optician. J. F. Hutchings, 42, High Street, Wincanton, Somerset.

POSITION required by one experienced in block and prescription work. Able to take charge of either. London or suburbs only. Box 5735, c/o "The Optician," 125, Fleet Street, E.C.4.

SIGHT-TESTING. Situation wanted, 30 years' experience, sole charge, can do repairs. B., 96, Hawthorne Street, N.F. Pool, Leicester.

YOUNG Man requires situation in London. 4 years' experience in workshop and sight-testing. Box 5741, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACER, 24, seeks situation. Thoroughly accustomed to prescription work. T.D., 251, East India Dock Rd., E.14.

EXPERIENCED Young lady required for prescription department. Box 5736, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED refractionist, 30 years' experience in workshop, testroom and fitting, would accept berth as manager or under-manager. Box 5740, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED. Shell and gold worker for repairs and adjustments. Box 5727, c/o "The Optician," 125, Fleet Street, E.C.4.

METEOROLOGICAL and Scientific Instrument Maker, disengaged, requires position, maker or repairer, hand-turning, bench work, finishing, lacquering, own tools. 18 years' experience, any distance. F. Orford, 83, Ashmore Road, Paddington, W.9.

Concluded on page 6.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE MIDGET



OPERA GLASS

(Licensed under Patent 12148/1912.)

(Actual size of Illustration.)

Perfect Interpupillary Adjustment.
Superior Lenses.

Claims immediate attention and commands ready sale.

Choice variety:—BLACK MOROCCO, GILT, FANCY LEATHER, PEARL, etc.

WRITE FOR SAMPLE.

R. ARCHER & SONS, Ltd.,

1, AMWELL STREET, LONDON, E.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

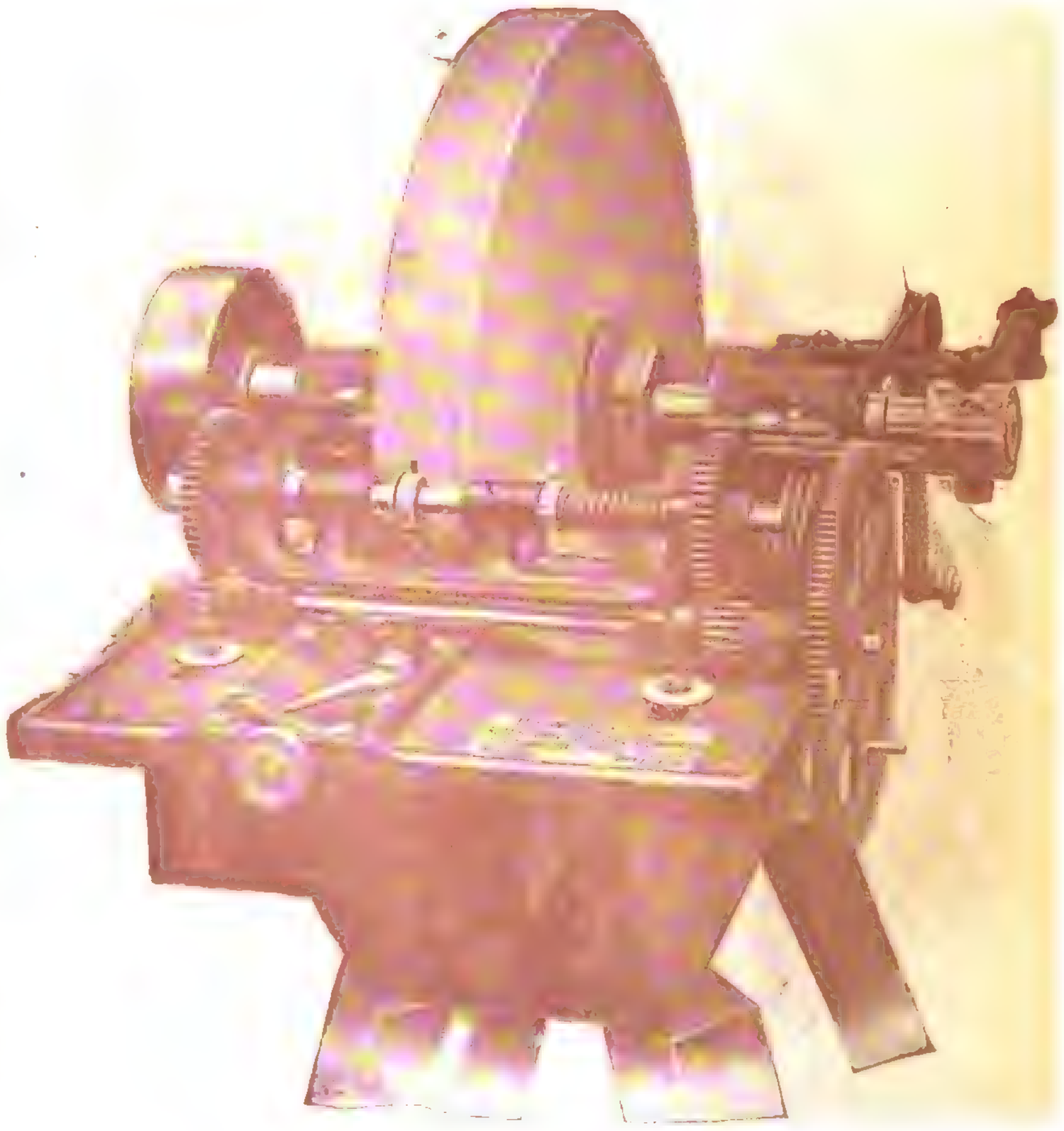
AMERICAN·OPTICAL·COMPANY, LIMITED

WORCESTER AUTOMATIC RIMLESS EDGING MACHINE.

This machine possesses many desirable features which particularly adapt it for prescription work in busy shops. Its principal feature is extreme simplicity in construction and operation. Its design is such that any wear on bearings in no way affects the shape of the Lenses being ground.

The price of the Machine is the same with or without legs, although the latter makes a difference in weight with corresponding reduction in freight charges.

Immediate delivery from stock can be made of the above Machines.



M. 73. Complete with legs.
M. 74. Without legs for bench use.

WELLSWORTH

TRADE (A) MARK (Reg'd

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, Nos. 34 and 125, Fleet Street, London, E.C.4. Printed by The Century Press, Fulham. Dec. 2, 1921.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT-MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1602 FRIDAY, DEC. 9, 1921.

ROSS BINOCULARS.



British Government Tests have proved these to be the finest Binoculars in the world.

Send for our new catalogues and terms.

ROSS Ltd., Clapham Common, LONDON, S.W. 4

ELLIOTT'S Rx SERVICE

leaves nothing to be desired.

ACCURACY—PROMPTNESS and REASONABLE PRICES.

104/5, GT. SAFFRON HILL, E.C.1



STOCK OPERA GLASSES NOW—

For Pre-duty Prices.

For the Coming Season.

ARCHER SELECTION.

R. ARCHER & SONS, Ltd., 1, Amwell Street, London, E.C.1

Reg'd at the G.P.O. as a newspaper PRICE 4d Subscription post free 12 months 17s

Postage in United Kingdom 1d

Digitized by Google Original from THE OHIO STATE UNIVERSITY

"Optical Almanac," post free 20s yearly. The Hatton Press, Ltd., 123-5 Fleet St., London, E.C.4.

AMERICAN·OPTICAL·COMPANY, LIMITED.



THE FIRST THING—

That people require of glasses is good looks. Sometimes it is called distinction of appearance, sometimes attractiveness, sometimes simply beauty. But whatever it is called, the Fits-U Windsor has it. And this Fits-U will demonstrate the fact.

The Wellsworth Windsor Construction is protected by British Letters Patent. Beware of Infringements.



FITS-U
WINDSOR
EYEGLASSES
" My prescription "

Offices, № 39 Hatton Garden, E.C., LONDON

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

THE

PATENT **L. W. ORTHOPS** 167902.



THE L-W ORTHOPS OPHTHALMOSCOPE

This new instrument is entirely reflecting and eliminates most of the difficulties of ordinary ophthalmoscopy; with the minimum of practice, an excellent view of the fundus is obtained.

The instrument is worked by an ordinary small dry cell battery, measuring $3\frac{1}{4}'' \times 3''$.

It is an instrument that should be possessed by every sight testing optician who wishes to make ophthalmoscope examinations.

It can be obtained from any Wholesale Optical House, from whom a fully descriptive pamphlet can be had on application.

Manufactured by **GEORGE CULVER, Ltd., London, N.1**

A

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

J&R F LTD

Some Suitable Lines for the Season's Trade

Immediate delivery from Stock.

Reading Glasses — REAL TORTOISESHELL; LOTOSHELL; SHELLULEX; ALUMINIUM; AMOPTOSCOPES

Spectacle and Eyeglass Cases — TORTOISESHELL; SOLID SILVER; A.O.Co. POLISHED ALUMINIUM

Lorgnettes — TORTOISESHELL; LOTOSHELL; SOLID GOLD; SILVER GILT; ROLLED GOLD

All lines are well finished saleable goods. We keep no others.

J. & R. FLEMING LTD.,

Telephone:
HOLBORN {814 / 815}
HOLBORN {2788 / 2789} Prescription Dept.

136-148 Clerkenwell Road,
LONDON, E.C. 1.

Telegrams:
"OTTICO." LONDON.

Branches with Prescription equipment:

WALTER BRAHAM & Co. Ltd.
8, Key Hill Drive,
BIRMINGHAM.
Phone: Central 2509
Telegrams: "Brahma."

37, WESTGATE STREET,
CARDIFF.
Phone: Cardiff 44
Telegrams: "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1085.
Telegrams: "Ottico."

8, SHUDEHILL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

J&R F LTD

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
The Rt. Hon. VISCOUNT HILL, L.C.C.

Upper Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Renter Warden
HARRY HYLTON-FOSTER. Esq., Past Master.

Director of Examinations
The Rt. Hon. SIR WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in May, 1922.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,602

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, DEC. 9, 1921.

Fees For Sight-Testing.—The old question of the advisability of promising "sight-testing free" to members of the public was brought up again recently in our columns by Mr. J. N. Arnold. Many optometrists find great attractiveness in the idea of charging a fixed fee for prescribing, distinct from the price of executing the prescription. That is agreeable to a sense of scrupulous honesty of course, for it is out of the question commercially that time and skill should be expended on measurements of refraction, merely with the purpose and result of selling eyewear as merchandise at a competitive price. Since it is impracticable that the service of sight-testing should be free in fact, it ought not to be free in name; so runs the argument.

* * *

We can all sympathise with this frank, straightforward course of reasoning, and admire the honesty of those who insist upon giving effect to it. None the less, we have to recognise that opticians who advertise "sight-testing free" excuse themselves upon the ground that their public virtually insists on being hoodwinked in this matter. They say that if their services are given freely at a loss,

Digitized by Google Original from THE OHIO STATE UNIVERSITY

on the other hand their goods are priced at figures to restore the due balance of profit. And who can say this is not a quite legitimate business proposition? The plan is in fact quite justified if consistently carried out, but has the drawback that a fixed scale of such adequate charges for goods leads to anomilies, as when a lens is replaced, or prescription filled. To make a professional charge for sight-testing, as doctors and lawyers do for consultations, would be the solution of all an optometrist's difficulties save this one—that he would lose more or less of his custom.

* * *

Price Tickets.—Quite a number of people are bargain hunters who practically ask to be duped, for they are out to get "something for nothing"; and the announcement of sight-testing free makes a potent appeal to their mean nature. But there is more than this; for people who are not so unreasonable and indeed so foolish as to expect an optician to work for them for nothing, yet choose to select the practitioner who will as they consider fit them with glasses at the lowest charge. Such people who are determined to "pay no fancy prices," often make window displays the criterion of what they consider reasonable prices; they are always on the look-out for ticketted windows when shopping. But price tickets in the window display of spectacles and eyeglasses offered by a sight-testing optician, are an inducement to damaging competition from other traders whose sight-testing is unskilled and perfunctory, or whose customers, perhaps, are even invited to "suit" themselves from trays of ready glazed eyewear— just as in the bad old times when sight-testing opticians were few and far between.

* * *

Some have sought to evade the difficulty by ticketting frames at low prices, afterwards putting the necessary profit on the lenses; but objections to that course are obvious. If an ophthalmic optician means to give to his show window the attractiveness which price tickets certainly have, he should display optical instruments, or meteorological and photographic apparatus, which provide an extensive range for the desirable variety in window dressing, and can be priced on the profit level for ordinary merchandise, as spectacles certainly cannot. We notice that the course here recommended is being followed to an increasing extent by retail establishments devoted mainly to ophthalmic work.

Legal Risks.—Where selling prices are conspicuously absent from a shop front, the legend "Sight-Testing Free" has certainly proved a draw to many ignorant and suspicious members of the public. Another argument that has been propounded in its favour is that, taken literally, it disposes of any question of legal liability in case of a mistaken diagnosis. Probably, however, it would be difficult to base any substantial claim for damages on the miscorrection of a simple defect of vision. The danger for opticians—as costly experience has shown—comes in with the incidence of eye disease. Hence the wording of announcements to the public as to what a sight-testing optician does or does not undertake to do, becomes important. There should be no implied undertaking to diagnose the presence of disease, the danger of that having been shown in a celebrated law case. The safe ground for an optometrist is to take his stand upon his knowledge of optics, in which he may claim to excel; for incidentally, we believe there are at the present day skilled ophthalmic surgeons whose acquaintance with visual optics—the refractive system of the eye and spectacle lens—is of the vaguest sort.

* * *

When by the aid of the ophthalmoscope an optician ventures on diagnosis of disease, he may be able to confer a benefit on his customer and win added reputation for himself. Or he may take a course sometimes commercially wise, saying nothing to the patient but referring him to a doctor and writing or telephoning to the latter. Here diplomacy is called for. An undiplomatic letter, instead of mollifying the doctor and making him at least a passive friend, may enrage and convert him to an active enemy. Form letters useful for guidance might be suggested by some of the trade societies. Also in the case of the before mentioned advertisement of the scope of an optician's business—comprehensive yet safeguarded against schemes or plots by litigious people—this might well be deliberated on, perhaps with the aid of legal advice, by one of the trade organisations.

* * *

Judicious Advertising.—While care is needed, it is not difficult to draft an advertisement conveying that the opticians' business is unconnected with treatment of eye diseases, and that the opticians' aim is to refer all cases of such disease to an oculist, but at the same time not implying any acceptance of responsibility for discovering incipient eye disease,

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

should such exist. We believe the practitioner can never injure any person, ill or well, by giving him an optical correction which produces normal vision. Therefore, all that has to be guarded against is giving loopholes to the enemy by incautious promises of a complete diagnosis. It is not a medical diagnosis but satisfactory glasses, that the customer should come to seek and the optician sell. More light might well be thrown upon the various issues raised by Mr. Arnold's letter by some further discussion in our columns from those interested.

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

Re Visual Equivalence of Lenses.

Sir,—Mr. E. Mayer (Paris) claims, in your last week's issue, that "a cardinal numbering is the only one that can afford this twofold equivalence (*i.e.*, equality of image distance and magnification). Any other system is devoid of such consistency." This is a well-known theoretical statement of the case, but it bears little relation with practical details, whether in instrument design or ophthalmic work. In *The Optician* (Dec. 24th, 1920, p. 241), the writer is reported to have said (on November 18th), that simplification is introduced by working from first principles, and ignoring the Gaussian principal points as unnecessary. Prior to that lecture I had actually confused the issue by working through a cardinal system to arrive at a vertex system! Mr. Whitwell independently writes (January 21st, 1921, p. 296), "It seems to me that equation (3) (a vertex relation) is easier to use than equation (4) (a cardinal relation) because in the latter one has to find the positions of both principal points and with all due respect to the shade of Gauss, this is a nuisance." This is the limit of the spontaneous acknowledgement by Mr. Whitwell, who if I read rightly favours a vertex marking.

Mr. Mayer pays greater attention to an academic equivalence for near vision and for magnifications, than does the writer. I suspect a fundamental misunderstanding between us. Possibly his near vision test is a separate *monocular* one, in which case, his definition of near equivalence holds. Usually, in this country, however, a rigorous monocular near examination is not made and it is to correct errors arising in consequence for cases of presbyopia, near lenses in anisometropia, and deep astigmatism, that the writer is concerned with in near equivalence. Mr. Mayer, I am sure, will agree that different pairs of spectacles would then be necessary, or *lenses* equivalent for distance will not be equivalent for near, and from this point of view independently of the marking.

The objections to the cardinal numbering are that it would complicate practice (and theory even), revolutionise existing standards without any sufficient compensating gain. Thus,

1. Neutralisation abandoned.
2. Standard trial cases scrapped.
3. Difficulty of placing second principal point of lens in correct position (see Mr. Mayer's article last week, pars. 1 and 2).
4. The slight gain in near equivalence is completely overwhelmed by the greater latitude allowable.
5. Binocular magnification equivalence not ensured (only of secondary importance).

Contrast each objection with the advantage of a vertex marking, viz. :—

1. Neutralising system enhanced in value.
2. Existing conceptions of true and nominal powers of trial cases simplified, no change of standard.
3. Tip of the eyelashes positioning factor.
4. The slight loss in near equivalence is more than counterbalanced by the advantage of a simpler calculation, embodying the conditions of application, etc.
5. Binocular magnification equivalence not ensured.

In any case a well defined policy of marking unsymmetrical lenses requires to be established between manufacturer, jobber and refractionist. The old system of "base curve" and "neutralising" powers specification, only benefits the manufacturer, not the user. In fact, the tendency to increase the number of base curves so as to approximate to "best form" is rendering revision imperative. Corrective tables must be increased for each base.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Judging by the way such tables were forgotten when the base curves were fewer, the increase of tables as well as such practice would be farcical. Any external system of correction, charts or tables is bad practice. An implicit specification is necessary.

The original idea of the base curve (to reduce the number of tools) is also violated. A new standard policy is required all round.

WILLIAM SWAINE.

PS.—On glancing through Mr. Mayer's letter (December 31st, 1920), I find that my letter above may be a little unjust to him as he states that the cardinal system lacks in practicability.

Do I understand, Mr. Mayer, that the object of your recent papers, is, not so much an advocacy of a cardinal numbering, as an elaboration of certain points which you consider have not received full investigation on the vertex principle?.—W.S.

Early Sight Testing.

Sir,—To encourage our good friend, Mr. Braham, to proceed with his reply, I drop "Notrom" for

J. PARRY MORTON.

39, North St., & Bank Chambers, Dowlais.

Sir,—In your issue of November 4th, Mr. G. Braham, of The Grove, Hammersmith, volunteered information about himself. In doing so he addresses himself to practically the whole body of opticians, and tells us that he passed his examination in Calcutta in 1879. He also concludes by asking you to "be good enough to publish his letter, as the travelling optician is so often referred to as the quack." He has been asked to give particulars of the examination he passed, who were his examiners, etc., and what certificate he holds (I presume he has one). Now, as one of the large body of opticians appealed to, I did not consider my identity as of any great interest in the matter—hence the *nom de plume*. However, as this appears a great obstacle to his replying to the question, I gladly remove that obstacle. I have no reason to be ashamed of my name—whether I am ungentlemanly or ignorant, I leave others to judge.

A. O. CAPEL.

32, College Road, Harrow.

Yearly Subscriptions.

Sir,—I have a great deal of sympathy with the B.O.A. assistants of Croydon, in their attitude *re* the greatly increased annual fees, but I am afraid their objections have come a little too late, at least so far as this year is concerned. I wonder how many of them took the trouble to attend the two special general meetings of members at which this increase was adopted, in order to register their votes against it.

I do not think they are wise in refusing to pay this year, but if they will only organise for the purpose they can probably obtain a reduced fee for next year. This cannot be done by revolutionary methods, nor is there any need for this kind of action. The method by which the increase was established can be used for dis-establishing it. Let them study the constitution of the Association, and get up the necessary petition for the holding of a Special General Meeting of members, and let them table the required resolution for fixing the subscription at a more equitable level. Then let them organise their supporters and get the resolution carried. The thing is simple enough.

May I suggest another resolution which could be dealt with at the same time. One which would make it compulsory that all further resolutions to increase subscriptions should be put to a referendum of all the members. The average country assistant cannot afford to attend General Meetings in London. Such attendance costs a Yorkshire assistant about £1, and the expenses from Scottish towns are almost double this amount.

A. STANLEY DOWNS.

36, County Arcade, Leeds.

At Dalgarno Gardens, N. Kensington, on Saturday, Dec. 3rd., a fast, clean, and scientific exposition of football was seen. The Bondwell F.C. (C. W. Dixey & Son), pressed continuously, and scored after 10 minutes. The home goalkeeper saved repeatedly in clever style for Cromwell, whose play improved. Half-time: Cromwell, 2; Bondwell, 2. The "Bees" were early aggressive in the second half, but poor shooting nullified many excellent movements. Cromwell retaliated, but the Bondwell backs defended with such effect that their goalkeeper was never seriously troubled. The "Bees" made great efforts in the closing stages, but could not score the winning goal. It was an excellent game throughout. Result: Cromwell Athletic (Ministry of Pensions), 3; Bondwell, F.C., 3. On Saturday, Dec. 10th, Bondwell F.C. oppose Highbury Institute at home, Lea Bridge Road. Supporters meet at Radley's Boathouse. Kick-off, 2.30 p.m.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY



Seeing's Believing

There is a lot of truth in that homely old phrase, and it applies with particular aptness to Chance's "Crookes" Glass, the properties of which sound to the uninitiated so mysterious in print.
Encourage people to call on you for a demonstration of

Chance's 'CROOKES' Glass

CHANCE BROS. & Co., Ltd., Glass Works, Smethwick, Birmingham



An instrument is now on the market to demonstrate to the public the efficacy of Chance's "Crookes" Glass in cutting off the harmful light rays.

The late Sir William Crookes, O.M. F.R.S., to whose researches was largely due the evolution of Chance's "Crookes" Glass.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

"WERTEX"

WILLMOTTS'

LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.

——— *F.S.M.C., F.I.O.*

Messrs. Willmotts Ltd.
Evesham. *London, 31-10-21.*

Dear Sirs,

Enclosed please find Cheque for September A/C.

Allow me to heartily congratulate you on "WERTEX" cases. I think you have succeeded in now giving us a case equal in every way to anything I have seen and at a lower price.

As long as you can supply me with a case similar to those of your first consignment you can rest assured that other makes will have no further consideration.

With all good wishes for the "WERTEX" future.

I am, Yours faithfully.

The above is one of many unsolicited testimonials. We asked this gentleman if we might use his letter & received the following reply:-

——— *F.S.M.C., F.I.O.*

Messrs. Willmotts Ltd.
Evesham. *London, 4-11-21.*

Dear Sir,

Thanks for yours of this morning.

By all means use the letter and if it brings you increased business I can only say you deserve it.

I am, Yours faithfully.

Samples may be had from your Dealer or direct from the Manufacturers—

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

ENGLAND.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Visual Equivalence of Lenses—II.

By E. MAYER (Paris).

When a lens which is placed before an eye is drawn forwards or backwards or replaced by another one more deeply curved, the approximatively equivalent correction is no longer the previous power D but another one D′. Now if the difference D′ − D does not exceed **0ᵈ25 in absolute value, we may consider it as** negligible. We shall say that the displacement of the second principal point of the lens is an *unimportant displacement* (provided, of course, it be an acceptable displacement).

According to the notations given in a previous article (*The Optician*, No. 1601), the difference D′ − D is given by formula

$$\frac{D}{(1-al)\,[1+a(D-l)]}-D$$

If we desire to find to what extent it is allowed to displace the principal point, we must express that this difference is $+\frac{1}{4}$ or $-\frac{1}{4}$. This gives, according to the case, one of the four following equations,

$$(8)\quad l(D-l)a^2-(D-2l)a+\frac{1}{4D-1}=0$$

$$(9)\quad l(D-l)b^2+(D-2l)a-\frac{1}{4D+1}=0$$

$$(10)\quad l(\Delta+l)a^2-(\Delta+2l)a+\frac{1}{4\Delta+1}=0$$

$$(11)\quad l(\Delta+l)b^2+(\Delta+2l)b-\frac{1}{4\Delta-1}=0$$

The roots *a* and *b* of these equations are the *limits of the unimportant displacements* provided they be acceptable according to formulas (4 bis.), (5 bis.), (6 bis.) and (7 bis.). If they are not acceptable, they must be replaced by the correspondent acceptable displacements.

For instance, if $D=+8^d,00$ and $l=0$, we have

$$\begin{cases} a = 4^{mm} \\ b = 3^{mm}9 \end{cases}$$

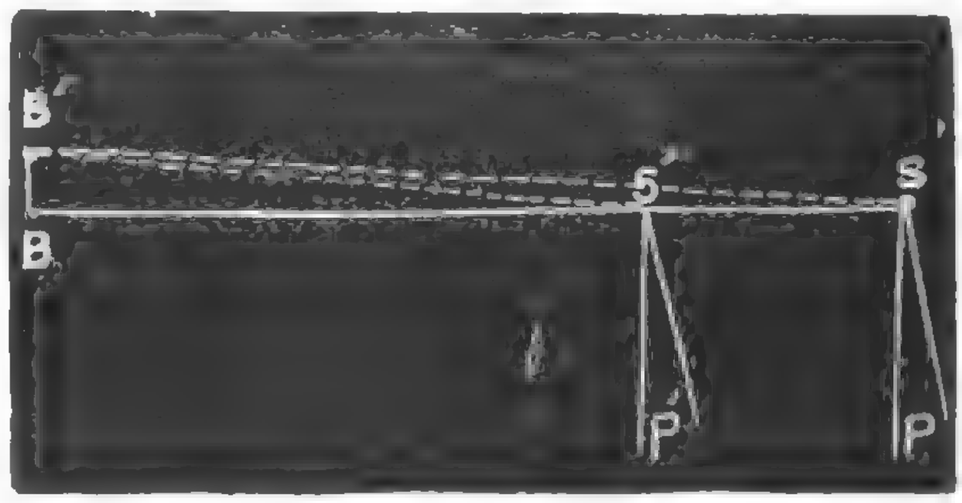
If $D=-20^d y\,0°$ and $\frac{1}{l}=0^m,33$, we have

$$\begin{cases} a = 0^{mm}9 \\ b = 0^{mm}9 \end{cases}$$

In the vertex numbered lenses, the computation of equivalence for near work is needless for any value of *a* that is less than the root of (8) or (10).

There is a kind of checking the subjective test for myopia which consists of removing from the eye the supposed correction and asking the patient if this displacement gives a better or a worse vision. In order that the result of this check be correct, the displacement must be less than the *acceptable* and greater than the *unimportant* one.

When instead of spheric lenses, we deal with prismatic ones, the influence of displacement may be expected at first sight. But we shall see that it is often negligible.



Let P and P′ be two prisms that are equivalent for an eye looking through them at a point-object B, that is to say two prisms that give the same image B′.

Let.

A▽ be the strength of prism P

A′ that of P′

a^m the distance of apexes S and S′

$\left(\frac{1}{l}\right)^m$ the distance of B to apex S

The deviation of rays BS and BS′ being very small, we may consider, for the minimum deviation, BS′ = B′S′ and BS = B′S. Then triangle B′SS′ gives

$$\frac{\sin B'SS'}{B'S'}=\frac{\sin B'S'S}{B'S}$$

or

$$\frac{\sin A}{\left(\frac{1}{l}-a\right)}=\frac{\sin A'}{\left(\frac{1}{l}\right)}$$

which gives

$$\sin A'=\frac{\sin A}{1-al}$$

or approximatively

$$A'=\frac{A}{1-a}$$

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Now, if we wish that the difference $A' - A$ be less than $\frac{1}{4}$, we must have

$$\frac{A}{1-al} - A < \frac{1}{4}$$

or

$$a < \frac{1}{(4A+1)l}$$

This condition is always fulfilled when object is at infinity ($l = o$).

If $l = 3.00$, the condition becomes

$$a < \frac{1}{12A+3}$$

With low prisms, for instance lower than 9^{Δ}, we may safely replace a plano-prism by a meniscus. But up from 9^{Δ} we must replace the strength A^{Δ} by $\frac{A}{1-al}$

Radiations, Illumination and Colours.*

By Dr. MAX COQUE, B.Sc.

II.—ILLUMINATION.

The emission of light by certain insects like the glow worm and the firefly and also by a number of marine creatures such as many molluscs and deep sea fish which shine in the dark is due to the same cause, namely chemical action, and the same conclusion applies to the emission of light by certain microbes.

Another kind of luminescence often termed Photo-luminescence includes the case of those bodies which give out cold light under the stimulation of light waves. The phenomenon of fluorescence, to which we have alluded several times belongs to this class; in this case, the emission of light is temporary, lasting only while the stimulation lasts.

The term phosphorescence is applied to those instances in which the emission of light persists after the stimulation of light has ceased. Certain substances, especially Sulphide of calcium and Sulphide of strontium, exhibit phosphorescence to a marked degree: when they are exposed to light for a little time and then placed in the dark, they emit light for a more or less prolonged period. The manufacture of luminous paint is based upon this property.

These phenomena, curious and interesting as they are, are not at any rate at present, used to produce artificial light for illumination purpose, and, therefore, we need not enter into more details about them. We might remark however, that the problem of the manufacture of artificial light is far from being solved, at least on an economical basis. Generally speaking, in most of our sources of light we convert about 98 per cent. of the energy that is being spent into heat which we do not require and only 2 per cent. in obtaining the light we do want. It has been ascertained that the case of the glow-worm and the firefly, the figures are about reversed, 98 per cent. of the energy supplied to the insect in the form of food being given up in light.

When a body is interposed between our eye and a source of light, it may happen that the luminous sensation produced in the eye is entirely extinguished which proves that the radiations emitted by the source of light or at any rate those radiations which are capable of determining a luminous sensation are arrested: the body interposed is said to be opaque. On the other hand, it may happen that the luminous sensation persists in which case the body intercepted is said to be transparent. In this case, however, the effect is not always the same. With some bodies, the colouration perceived by the eye is the same as that produced by the source of light itself and this shows that the interposed body allows all visible radiations to pass through it; such is the case for water or ordinary glass in small thickness, air, etc. With other bodies, on the contrary, the colouration changes and for certain sources of light, the sensation may be entirely extinguished.

It is easy to ascertain the nature of the phenomenon by producing a continuous spectrum or a solar spectrum which for the present purpose may be regarded as practically continuous, and by interposing the body we want to investigate on the path of the light, before it reaches the prism which serves to separate the variously refrangible radiation constituting the incident light. It is then seen that the spectrum changes in appearance; it is not as long as before, the violet end or the red end being suppressed, or again, some dark bands replace some portions which were previously visible. The existence of these dark portions show that the corresponding radiations no longer reach the screen; they have been arrested, *i.e.*, absorbed by the body

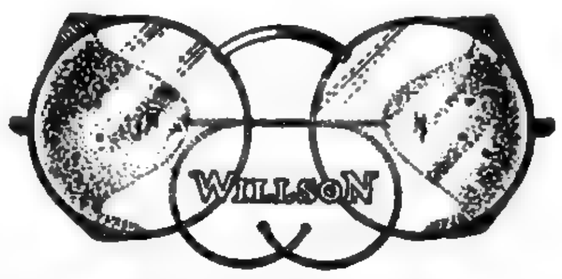
*Concluded from page 234.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

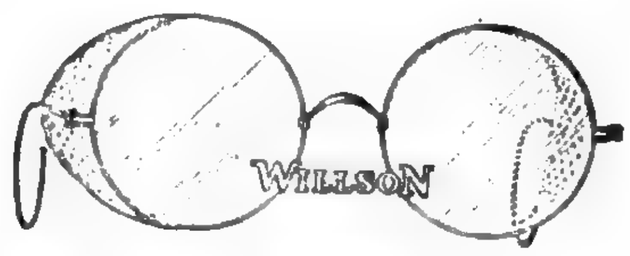
WILLSON GOGGLES

We Invite Correspondence.

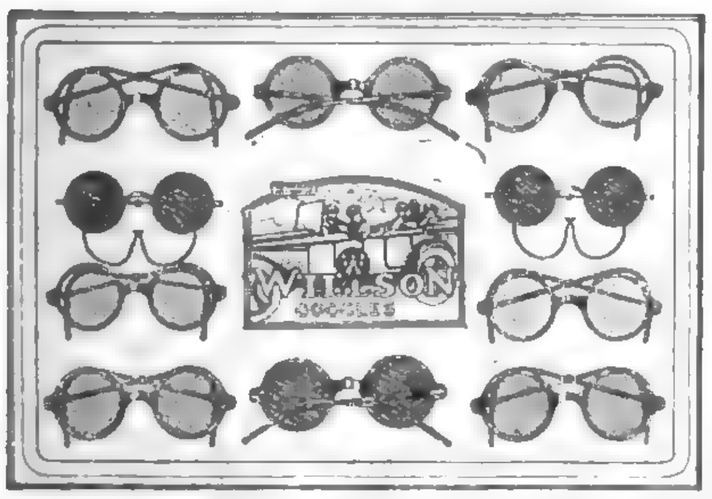
We manufacture goggles for protecting the eyes from sunlight, dust, glare and wind. Also safety goggles for protecting workmen at industrial operations.



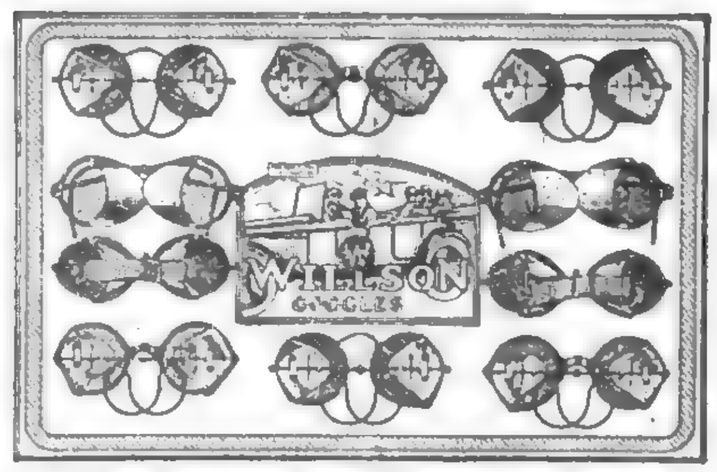
Style A1.—48mm micoquille lenses in amber, fleuzal, smoke and amethyst colors; or clear. Good leather side shields, adjustable bridge and cable temples. Metal case.



Style N88.—48mm micoquille lenses in amber, fleuzal, smoke and amethyst colors; or clear. Perforated metal side shields, saddle bridge and cable temples. Cardboard box.

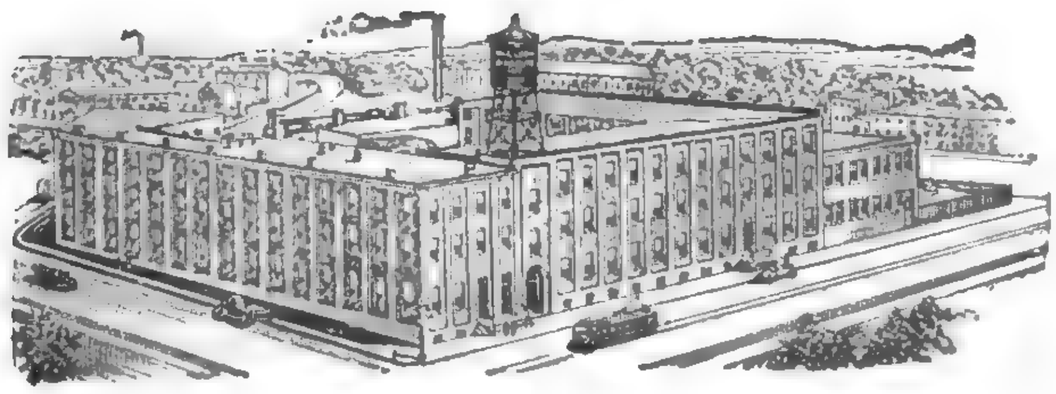


Assortment Y10.—Ten high-grade imitation shell goggles WITHOUT side shields displayed on a heavy, colored artboard with easel. The goggles are sold off this display at a uniform price. Strong shipping container.



Assortment Y15.—Ten high-grade goggles WITH side shields. Assorted styles of imitation shell, white metal and their combinations. Same display board and shipping container.

These assortments have good-quality micoquille lenses in the most popular colors.



WILLSON GOGGLES INC., READING, PA., U.S.A.

British Office and Warehouse: S. PULZER, 9, Hatton Garden, London, E.C.1

Australasian Representative, WILLIAM LEWIS, Ltd., Stafford House, 316, Pitt St., Sydney.

Largest plant in the world devoted exclusively to the manufacture of eye-protective devices. Trade Mark Registered in The United States Patent Office, Great Britain, Australia, France, Brazil, Argentine, Chile, Bolivia, Peru, Uruguay, Cuba and Japan.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

OPTICAL MANUFACTURERS LTD.,

(Incorporating Wheway Optical Co., Ltd.)

WAR TIME CONTRACTORS TO THE ARMY SPECTACLE DEPOT.

Manufacture for the Wholesale Trade:—

Gold and Gold Filled Spectacle and Astig Frames.

Gold and Gold Filled Rimless Spectacle and Finger Piece Mountings.

Gold and Gold Filled Monocles and Reading Glasses.

Solid Nickel Spectacle and Astig Frames.

Solid Nickel Pillar Frames and Folding Gauze Spectacles.

Steel Spectacle Frames.

Spectacle Sides and Jobbing Materials, in all Metals.

Extract from a letter just received by a large Wholesale House:

"We have sold Wheways spectacles for a long time now, and as they have given us such all round satisfaction we have every confidence in them and desire to stock all their products where possible."

All these Articles are of English Manufacture

Works at VYSE STREET and GEM BUILDINGS, HOCKLEY HILL, BIRMINGHAM.

London Office: 55, HATTON GARDEN, E.C.1.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

under investigation. It is easy to realise that if we suppress the prism (whose presence is necessary to the production of the spectrum) some of the radiations being arrested by the body on which we investigate, the beam of light emerging from that body will differ in constitution from the incident beam and, therefore, the colouration of the light will be generally altered.

Transparent Coloured Bodies.

If the above experiment is performed with a beam of white light containing all the visible radiations of the solar spectrum, it will be found that after passing through a transparent body the incomplete beam will give the sensation of a particular colour which depends on the radiation present in the emerging beam and, therefore, on the radiations absorbed by the transparent body. In that case, the transparent body is said to be coloured; if for instance, a piece of glass placed on the path of a beam of solar light arrests all visible radiations except those giving rise to a sensation of red, the glass is said to be red. Generally however, transparent coloured bodies do not completely absorb certain radiations but merely diminish more or less their intensity. Thus, a piece of ordinary green glass not only allows green to pass through it, but also a certain amount of yellow and even red. A piece of glass coloured by means of oxide of copper is pure red inasmuch as it absorbs all the radiations, the mixture of which constitutes white light except those giving the sensation of red. A solution of bichromate of potasium only allows yellow and a little orange to pass through it.

The effect produced by transparent coloured bodies are very different if the light which strikes them does not contain all the radiations constituting white light, *i.e.*, if the incident light itself is coloured. Three possible cases may occur:—

(1) The incident beam does not contain the radiations which the transparent coloured body is able to absorb. It is obvious that the light considered will pass through the transparent body without any change. Thus, if we remove all colours except red from solar light (and this can be done by causing a beam of solar rays to pass through a piece of glass coloured with oxide of copper) and if we receive the beam thus modified on a transparent body allowing red only to pass through it, say another piece of the same kind of glass, the beam will not suffer any modification.

(2) The incident beam only contains radiations which are absorbed by the transparent coloured body; nothing will pass through the latter which is then opaque for the light in question.

(3) The incident beam contains a mixture of coloured radiations, some of them will be absorbed by the coloured transparent body and the emergent light will have a colour due to the mixture of the radiations which this body allows to pass. In this case, the transparent body may appear with a colour different from that which would be observed if the incident light had been white light. These remarks explain what happens when two differently coloured transparent bodies, say two plates of glass are placed together on the path of a beam of light. The emergent light will only contain those radiations which are not absorbed either by the first plate or by the second and the colour of that light will depend on the nature of the radiations allowed to pass through the two plates. A plate of glass coloured with oxide of copper is truly red inasmuch as it only allows the red of the spectrum to pass through it. A liquid obtained by adding a slight excess of ammonia to a solution of sulphate of copper is of deep blue colour, *i.e.*, only allows the blue of the spectrum to pass through it. If we place together the plate of red glass and a tank containing the blue solution, whatever the nature of the incident light striking the system, the plate of glass will only allow red radiations to pass through it, if there are any in the original beam, but these radiations are arrested by the liquid solution which is only transparent to blue radiations. It follows that an eye placed behind the system will not receive any visible radiations. The same will happen if the incident light did not contain red radiations since then the plate of red glass itself does not allow anything but red light to pass through it.

Infra-Red and Ultra-Violet.

What we have said just now on the subject of visible radiations applies to infra-red and ultra-violet radiations, various bodies absorbing more or less completely some of these radiations and permitting some others to pass through them. Only the resulting effects are not visible since the infra-red and ultra-violet radiations do not give rise to a luminous sensation. These effects, however, can be rendered evident, in the case of the ultra-violet radiations which are of interest from the point of view of the hygiene of the eye, by substituting a photographic plate to the observer's eye. A spectrum is formed on that plate by means of a prism interposed on the path of the

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

light which has passed through the body under investigation. The plate will be acted upon outside the limits of the violet if there are ultra-violet radiations in the light which strikes the prism.

This method has the advantage of giving a permanent record of the effect produced but it has the drawback of necessitating somewhat long manipulations. There is another method of investigation which gives immediate results but does not leave any permanent trace. It rests on the fact already mentioned that certain substances, termed fluorescent, emit visible radiations under the influence of ultra-violet radiations.

Diffusion.

When a beam of light travelling in a medium such as air strikes the non-polished surface of separation of another medium, the phenomenon we have described under the heading of diffusion is observed. Differences may, according to the nature of the media considered, take place in the second medium as well as in the first. From our present point of view it is diffusion in the first medium which is of importance since it is the case which occurs constantly with illuminated objects; we have already stated that it is owing to the light diffused or scattered at the surface of non-luminous objects that such objects are seen. Diffusion in the second medium is observed in translucent bodies, like ground glass. This case is less important and what we are going to say applies to it, *mutatis mutandis*.

Various bodies illuminated by a same source do not appear to have same colour and, therefore, the radiations they diffuse are different in constitution though the incident light is the same; the conclusion to draw from this is that owing to diffusion, some radiations are partly or completely absorbed. This absorption takes place in various ways according to circumstances.

For instance it may happen that owing to diffusion a particular body absorbs all the visible radiations in the same proportion; the diffused light will then be less intense than the incident light but since this diffused light contains the same radiations as the incident light and in the same proportion the sensation caused by the surface of the body will be of the same colour as that due to the incident light. Thus if the incident light is white as it happens if the source of light is the sun, the diffusing surface produces in our eye the sensation of white and we say that the diffusing body is white. It must be well understood however, that the body in question will only appear white in the circumstances just described and that it may appear red or green or blue if the incident light itself is red or green or blue. The main characteristic feature of the body is that it does not modify the colour of the incident light. It is regrettable that a special expression has not been coined to denote this properly and that the term white is used since that term is only justified if the incident light itself is white.

In the case of many bodies, however, the various radiations are absorbed differently, some of them being more or less entirely absorbed or extinguished while others are little modified.

If such bodies are illuminated by white light they will diffuse a light which will give the observer's eye the coloured sensation resulting from the combination of the radiations that are not absorbed and it is usual to say that the diffusing body is of that colour. It is important to observe that the same body may give rise to various coloured sensations, *i.e.*, may appear as differently coloured, according to the composition of the incident light. Thus, if the incident light does not contain the radiations which the body absorbs by diffusion, the composition of the diffused light will be the same as that of the incident light, the same as that of the light which would be diffused by a white body; the coloured sensation produced in an observer's eye will be the same, whether this eye receives the incident light directly or whether it looks at a white body illuminated by the incident light or whether it looks at the body considered.

Or again, the incident light may only contain those radiations which are absorbed by the diffusing body, in which case this body does not diffuse any radiation at all and gives the eye the sensation of black.

Selective Absorption.

Or finally the incident light contains a mixture of radiations, some of which are absorbed by the diffusing body. In this case, the diffused light will give rise to a coloured sensation different from that due to the incident light which may be quite distinct from that which would result if the same diffused body were viewed in white light; in other words the colour of the diffusing body will be appreciably altered.

It it hardly necessary to state that the phenomenon of diffusion is not restricted to visible radiations and that it is manifested by the infra-red and ultra-violet radiations but the presence of these radiations in the diffused light does not modify the colouration of that light.

A surface which diffuses radiations may

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

W.H.T.

WE DON'T HOPE FOR THE BEST, BUT GET IT AND GIVE IT IN OUR PRESCRIPTION WORK

A SERVICE OF ACCURACY, EFFICIENCY, AND PROMPT DESPATCH.

LET US CONVINCE YOU.

OPHTHALMIC SUPPLIES

OF EVERY DESCRIPTION FROM THE TRIAL CASE TO THE EYEGLASS CHAIN.

WALTER H. THOMPSON

66 HATTON GARDEN, LONDON, E.C. 1.

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

NOVEMBER EXAMINATION RESULTS: MANY SUCCESSES!

Your Opportunity to

QUALIFY IN OPTICS

PRACTICAL WORK. Students taking the Course may receive personal tuition in the practical work AT ANY TIME DURING THE COURSE.

Please read these extracts received from some of the students who passed the recent examinations.

"It is a great pleasure to me to feel I have surmounted this as studying after the worries of business is, as you know, very distasteful and hard work.

I wish to express my grateful thanks to you for your kind help and patience, and say how much I have appreciated **the excellent way in which your lessons are described. The clearness in which the knotty points are explained is particularly noticeable to one who has experienced other postal courses.**

J. B. SIMMONS."

"Notification has reached me to-day that I have passed the S.M.C. examination. I want to thank you very much for **careful coaching and straightening out of difficulties.** Besides the qualification, the Course has been a **very valuable refresher as to methods &c.**, and quite worth while from this standpoint only.

R. G. NEAVE."

"I would like to take this opportunity of saying that owing to **your very lucid course and the painstaking manner in which you have helped me** over the various difficulties that I experienced while under your tuition, I was able to negotiate this somewhat difficult examination.

A. B. BARNARD."

Each Student receives Thorough Tuition, Personal Guidance and Individual Interest throughout the Course.

Expert Tuition by Correspondence for the SIGHT-TESTING DIPLOMAS of the Worshipful Company of Spectacle Makers (F.S.M.C.), or the British Optical Association (D.B.O.A.).

Write for full particulars—

C. A. SCURR, M.P.S., F.S.M.C., F.I.O., etc.,

64, High Street - - - - BARNET.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

serve to illuminate another surface: the effects produced on the latter depend on the constitution of the radiations diffused by the former, *i.e.*, it depends at the same time, on the nature of the luminous source which illuminates the first diffusing surface and on the manner in which this surface behaves with respect to the incident radiations.

Comparative Illumination.

What we have said concerning the comparison of illumination in the case of white surfaces is applicable to the case of coloured surfaces, provided these surfaces be of the same colouration.

The comparison of two illuminated surfaces of different colourations is not such a simple problem for two main reasons; the first, is that we do not easily appreciate the equality or the non-equality of two differently coloured sensations: the second, is that on comparing the illuminations of two surfaces differently coloured, the appreciation of equality of illumination depends on the absolute value of illumination whereas such is not the case when we compare illuminations produced by white light.

It may be useful to examine the above fact a little more closely. Let A and B be two surfaces equally illuminated by white light and producing therefore in our eyes, sensations of equal intensities. If we alter in the same proportion the illuminations of A and B, which can easily be done, by reducing by half the distances separating these surfaces from the source which illuminate them, we will find that although the two illuminations are increased, their equality subsists: this is an experimental fact and it would be difficult to expect anything else. If, however, we repeat the experiment with surfaces of different colouration, the result will be different.

Let us suppose that the surface A be violet and the surface B yellow and let us suppose that these are so illuminated that they give the sensation of equality of illumination, at least, so far as can be recognised in practice. If then the illuminations are altered in the same proportion, as in the above experiment, by altering the distance of the luminous source from A and B these two surfaces do not any longer appear as being equally illuminated. If the sources of light are removed from the surfaces A and B, to the same extent, *i.e.*, if the illuminations of these surfaces are diminished in the same proportion, the yellow surface seems to be less bright than the violet one whereas the contrary happens if the sources are brought closer to the surfaces, *i.e.*, if the illumination of the surfaces are increased in the same proportion.

The consequence of these observations is that the impressions of equality of two differently coloured sensations does not merely depend on the value of the ratio between the quantities of objective light but depends also on the absolute value of these quantities. This curious phenomenon, which is of extreme importance in physiologic optics, is termed Purkinje's phenomenon, after the name of its discoverer. It explains why in twilight blue colours appear lighter and red colours darker than when they are seen under ordinary illumination. The fact can easily be observed at dusk on a summer's evening in a garden of variously coloured flowers.

Up to now we have spoken of the equality of illumination as it results from the direct observation of two given surfaces. Though illumination and brightness are often confused, they are really two different things. When light strikes a surface, this surface receives illumination; whether the surface appears bright or not depends on its reflecting or diffusing power. We shall revert to this point later on.

Another question presents itself. There may be, traced on the surface considered, signs which have to be seen in all their details, for instance, letters which have to be read. This brings us to the relation of illumination and visual acuity.

It has been proved that in white light, the visual acuity of a given subject increases with the illumination though not proportionally. For low illumination the visual acuity increases quicker than the illumination up to a certain point and then, if the illumination still increases, the visual acuity increases more slowly and becomes almost invariable when the illumination reaches a definite value.

Influence on Visual Acuity.

An increase in the illumination of a white surface has a double effect: it increases the brightness of the surface and it also increases the visual acuity. From the practical point of view, the latter result is more important as it is mainly because of the increase in the visual acuity that we are enabled to recognise the details of the objects. In the case of coloured lights, it is possible to study the variations of the visual acuity when the illumination varies and the question does not present any special features provided the colour of the light used is always the same: the results obtained are exactly similar to those we have mentioned just now in the case of white

Digitized by Google Original from THE OHIO STATE UNIVERSITY

DUPAUL, YOUNG OPTICAL CO.,

SOUTHBRIDGE, MASS., U.S.A.

The "ONLIWON" GOLD FILLED INNER RIM ZYLO FRAME.



WE claim we have the ONLY ONE of this class of frame that is scientifically and mechanically perfect in construction.

The most important feature of the "ONLIWON" FRAME is, the way the outer Zylo rim is drawn and closed over the gold filled inner metal rim by a mechanical process known as 'crimping,' which means curling, turning, drawing. pressing, squeezing. Burnishing one over the other by heat and pressure, thus firmly clamping it securely to the now imbedded inner metal rim, without screws. rivets or clamps.

"ONLIWON" Frames can be formed to any desired shape of eye without the two rims separating.

"ONLIWON" Frames have thin, inconspicuous rims and are not clumsy or showy.

All our Bridges have a Rounded Base at Shank.

Which absolutely prevents the Breaking or cracking of the gold shell of the filled metal during the process of shaping them to size, which is distinctly a Dupaul, Young Optical Company feature on all our frames.

The special KANTFEEL TEMPLES used on "ONLIWON" FRAMES are so made as to almost totally eliminate their breaking at the end-piece.

To be obtained from all Wholesale Optical Houses.

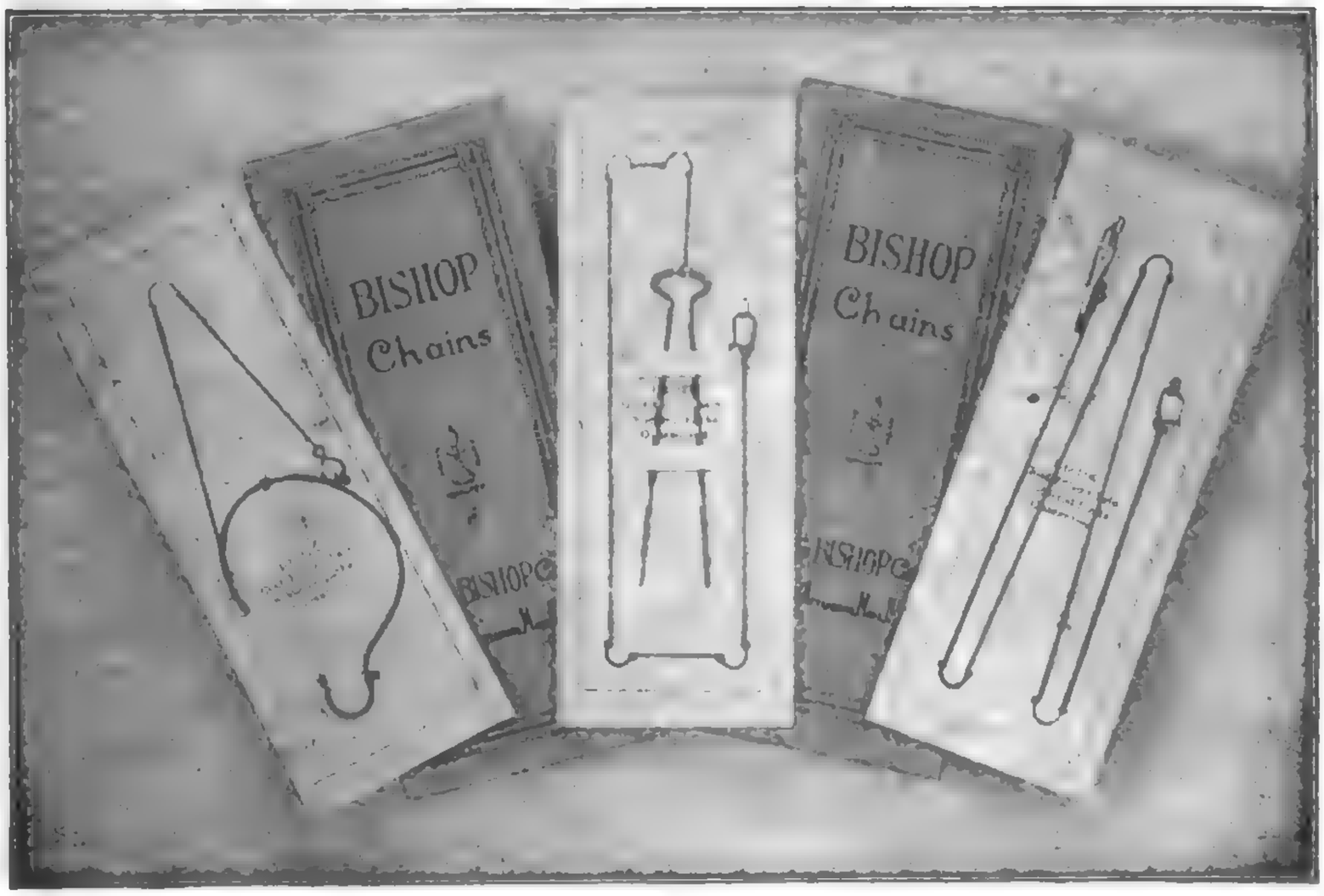
LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE BISHOP CO., INC.,
NORTH ATTLEBORO, MASS., U.S.A.



EYEGLASS CHAINS

In Gold and Gold Filled

GUARANTEED QUALITY, BEST WORKMANSHIP,
PERFECT COLOUR, SOLDERED LINKS.

ALSO

SILK EYEGLASS & MONOCLE RIBBONS

With Gold Filled snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

light. When, however, we deal with light of different colours the matter is not quite as simple. Let us suppose that two lights of different colours produce respectively on two given surfaces, illuminations which we judge to be equal (at least, as far as we can judge of equality in these circumstances). It can be readily ascertained that letters of same size will not be read equally easily; in other words, though the two lights considered apparently produce equal illumination of the two surfaces they do not give same visual acuity.

Lighting and Definition.

It is important to study the matter of equality or inequality of visual acuity by finding out the degrees of illumination which, when produced on two differently coloured surfaces, permit to an observer placed at the same distance from the two surfaces, to see equally distinctly letters of same size drawn on these surfaces.

It must be observed that the phenomenon of Purkinje occurs for variations of acuity exactly as it does in variations of illumination. That is, if it has been found that two different coloured illuminations give same visual acuity and if the two illuminations are altered in the same proportion, for instance by bringing the sources nearer to the surfaces, the equality of the visual acuity is no longer conserved. Therefore, we must conclude, exactly as we have done in the case of illumination, that the equality of acuity for two differently coloured illuminations does not merely depend on the ratio between the quantities of objective light, but also on the absolute values of these quantities.

A remarkable fact is that the phenomenon of Purkinje does not manifest itself equally in the whole extent of the spectrum. In the portion corresponding to the least refrangible radiations from the extreme limit of red to the radiation having a wave-length of 507 corresponding to the limit of the pure green and the bluish green, Purkinje's phenomenon is little marked, both with respect to the brightness and to the visual acuity. In the portion of the spectrum extending from the bluish green to the extreme violet, the phenomenon of Purkinje is very apparent and it follows that in a general way, we cannot determine the repartition of the illumination or the value of the visual acuity in the various portions of a given spectrum since these depend on the absolute value of the luminous intensity. Though the question cannot be solved for the whole extent of the visible spectrum it can, however, be investigated for the least refrangible portion of the spectrum in which Purkinje's phenomenon is not appreciably observed. Mace de Lepinay and Nicati have made important contributions to the study of this subject. We reproduce the table in which they give the repartition of the intensity from the points of view of visual acuity from the extreme red end to the radiation corresponding to a wave-length of 507 $\mu\mu$.

Lines	Wave Lengths		Visual Acuity.
	681	$\mu\mu$	0.015 or 6/100
C	656	...	0.080 or 6/75
	641	...	0.111 or 6/50
	613	...	0.252 or 6/24
D	589	...	0.765 or 6/8
	569	...	1.000 or 6/6
	550	...	0.950 or 6/6.3
	531	...	0.512 or 6/12
E	527	...	0.900 or 6/6.6
	520	...	0.314 or 6/18
	507	...	0.128 or 6/50

This table shows that the value of the acuity very small in the extreme red, increases first slowly, then more quickly to reach its maximum in the yellowish green, after which the diminution is rapid at first and then becomes more slow. In the bluish green, *i.e.*, for radiations of a wave-length of 520 visual acuity is reduced to about a third of the maximum value; it becomes 6/50, *i.e.*, less than 1/8th of its standard value for the wave-length of 507 corresponding to about the limit between green and blue.

In a further article, we shall proceed to a brief study of the two main practical problems in photometry, namely, the measurement of illuminating powers and the measurement of the illumination at a given point on a given surface. Then we shall investigate the comparative value of the various methods of illumination from the point of view of the hygiene of the eye.

You cannot afford to do without THE OPTICIAN. As a manufacturer you need be acquainted with all published information bearing on design and on workshop technique. As a merchant you require to be kept informed of the latest novelties in spectacle-work and scientific instruments, so that you may be able to deal intelligently with all enquiries on these matters. As a sight-testing optician you want to know what is newest in connection with the refraction of the eye and the prescribing and fitting of spectacles. If you are interested in any way in the optical industry, you must keep abreast of its development by reading the technical and other trade news which is to be found only in THE OPTICIAN.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Actual Manufacturers.

WILLIAM GOWLLAND, LTD.,

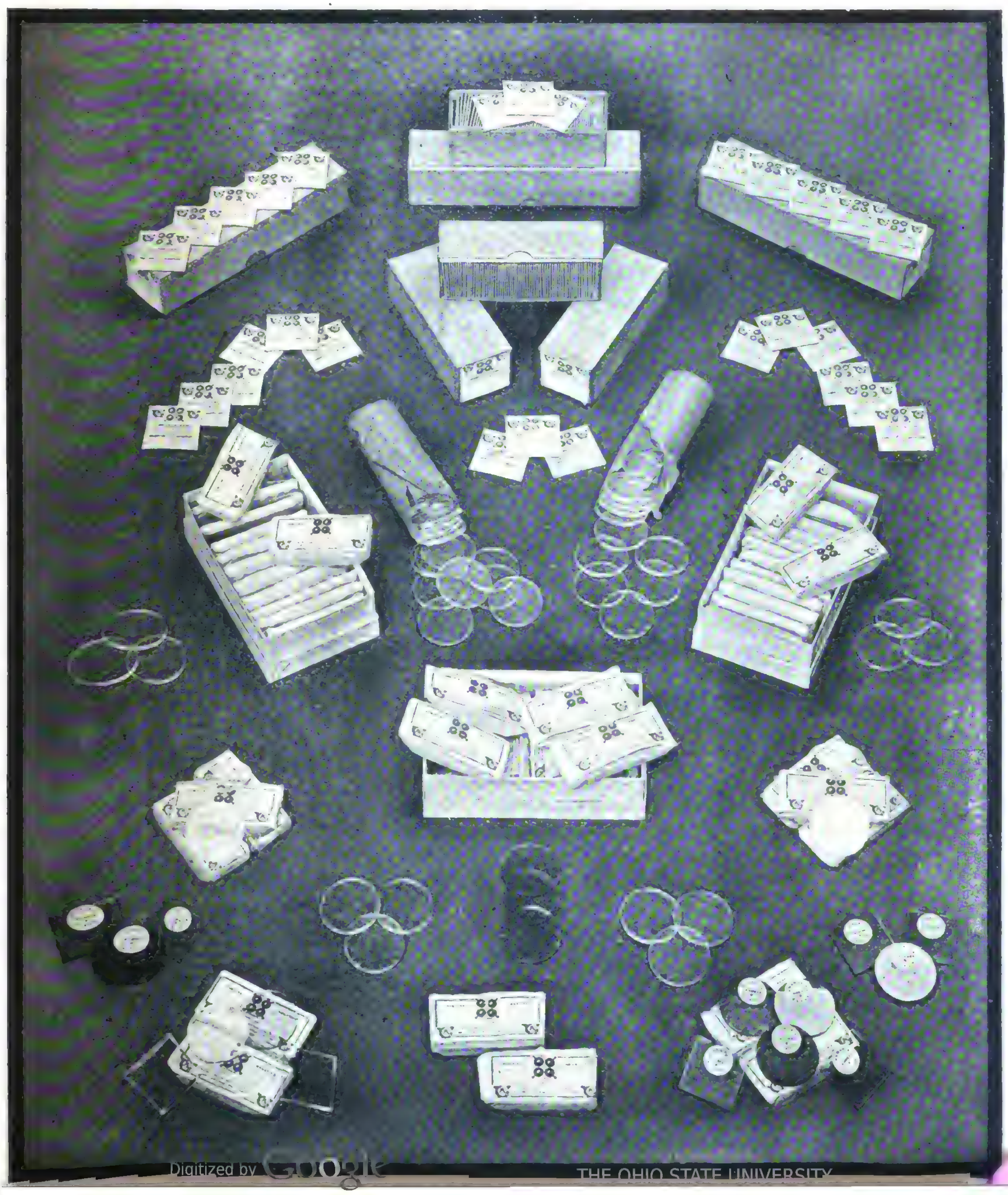
Price Lists on Application.

Optical Works, Morland Road, CROYDON, LONDON.

AND AT PARIS.

Telegraph: "Fundus, Croydon."

Telephone: 463 Croydon.



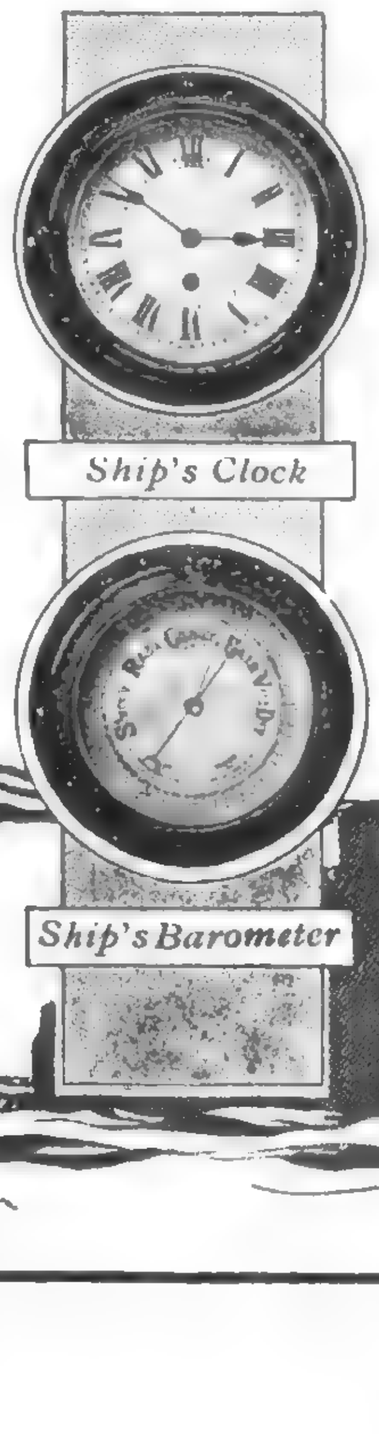
Digitized by Google

THE OHIO STATE UNIVERSITY

T. A. R. & Co.

"THE ALL BRITISH HOUSE."

Over 2,000 Designs in Aneroid Barometers.



Time and Tide
And Ship's Instruments



T.A.REYNOLDS & CO
40-1-2 PERCIVAL STREET,
LONDON E.C.1



Steam-pipe Thermometer *Hydromcter*

Telegrams—
"THERBAROME. LONDON."

Telephone—
339 CITY.

Showrooms and Offices at above address.

If you are a Retailer and need ORIGINAL LINES in Barometers, Clocks and Thermometers, write us, and although we will not supply you direct, we will put you in touch with the Nearest Wholesale House.

WHOLESALE AND SHIPPING TRADE ONLY.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

British Lampblown Scientific Glassware Manufacturers' Association

General Meeting of the Trade.

The British Lampblown Scientific Glassware Manufacturers' Association, Ltd., is now completing the fourth year of its existence, and a short statement relating to its functions may be of advantage.

The Association was formed in 1917, on the suggestion of the Ministry of Munitions, who felt the necessity of a representative body for consultation and negotiation on the supply of lampblown scientific glassware. As such it has undoubtedly fulfilled with success highly important functions. Latterly interest in its activities has somewhat waned. The war having ended and its work, therefore, not being quite so much in the limelight, coupled with the general slump in trade, are doubtless mainly responsible for this. Yet anyone in our highly important blown glassware industry who gives the matter a little consideration must agree that the existence of the Association is most important, if the industry is to be generally successful in this country. The advantage of an Association like this to the industry may perhaps be summarised as follows:—

First, it ensures the existence of a representative body to fight the battles of the trade, voice its opinions, formulate schemes of expansion, and generally consider the position and condition of the industry at any given time. It serves as a medium for the interchange of ideas and the adoption of plans tending to general success. In times of crisis it may become an instrument of protection or aggression on matters of general policy. It has served, is serving and will continue to serve as a medium of communication between Government Departments such as the Board of Trade, the National Physical Laboratory, the Home Office, and other great public bodies, all of which prefer and often insist upon dealing with a representative organisation.

Second, the offices of the Association serve as a common meeting ground of the members. Any member requiring information or wishing to make suggestions can communicate with the Secretary and thus bring the matter before those particularly interested in a way that it would be impossible to do did such an Association not exist. It serves also to collect and circulate trade statistics and general information.

Third, it offers to its members a means of social intercourse and friendly conversation and consultation which would be very difficult in the ordinary course of competitive business.

It claims full credit for its share in the introduction of the Key Industries Bill by which foreign products of lampblown glassware are subject to 33⅓ per cent. duty—a serious attempt to fight against the unequal competition from Germany and elsewhere. It is lodging an appeal for a further imposition of 33⅓ per cent. on German and other glassware on account of the collapsed exchanges which enable foreign goods to be "dumped" in here at unfair prices. It is urging the introduction of a revised Merchandise Marks Act to enforce imported articles being marked with the country of origin; and it has organised a magnificent series of lectures on glassblowing.

The Hon. Secretary of the Association, Mr. G. F. Prince, summarises as follows:—"What the B.L.S.G.M.A. is going to do":—It is urging forward the compulsory test of clinical thermometers. Efforts will not be relaxed until this Bill has passed and the stringent specification of the N.P.L. introduced, when only the best thermometers will pass the test. It will publish the twelve lectures on glassware manufacture as a permanent addition to the bibliography of the trade. It proposes to reduce the subscriptions to: Full Members, £7, Associates, £2, provided that a sufficient number of both classes announce their determination to join for the coming year. It will urge forward the principle that harmonious trading between members may be arranged and carried out. It will press for reasonable reductions of the price of glass tubing to the benefit of the whole trade.

Co-operation of Members.

It is hoped that the New Year, 1922, will bring a great influx of new members, so that this Association may be thoroughly representative of the whole industry. All whom it may concern and whose livelihood depends upon the success of the industry represented by the Association are asked to join. The friendly intercourse and co-operation of members must necessarily tend towards a healthy and harmonious spirit throughout the whole trade.

A General Meeting of those engaged in the industry will be held at 2.30 p.m., on Monday, December 12th, at the Offices of the National

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Union of Manufacturers, 6. Holborn Viaduct, E.C., when it is hoped readers of *The Optician and Scientific Instrument Maker*, who are interested will be present. The meeting is being called in order to give an opportunity for all to express an opinion as to the best means of assisting the Trade and of strengthening its position. Attendance at this meeting will imply no obligation to join the Association.

Light and Chemical Energy.*

By Professor PIERRE WEISS, University of Strasbourg.

Let us consider the question of polarised light. As we know, luminous vibrations are transverse instead of being longitudinal like those of sound. A metaphor will readily enable us to understand what is meant by the polarisation of light. It is a simple matter to put a letter in the post box if we present its edge parallel to the slit in the box, but if we present it in a perpendicular position to the slit it will not enter. The apparatus known as a polariser may be compared to a letter box having a vertical slit. Let us now suppose a second slit in the letter box opposite the first.

If these two slits are perpendicular to each other the letter will not pass through; if they are parallel it will pass. Correspondingly we may take a second polariser and place it opposite the first in the path of a ray of light. To distinguish the two we call this second polariser the analyser, a word which expresses its function. The first apparatus is placed so as to allow vertical vibrations to pass. If the analyser is arranged in the same way light will pass through the two without any difficulty, just as the letter passes through the two parallel slits in the box. But if we cause the second apparatus to revolve 90° round the ray of light as an axis of rotation, in this position it will allow only horizontal light to pass, and since the light coming from the polariser is vertical no light will be able to pass.

Now, let us make an experiment. By the rotation of the analyser at a right angle we pass from full light to darkness, *i.e.*, *extinction* and then by a new rotation, likewise of 90°, we pass from extinction to full light and so forth. It is obvious that this experiment can be comprehended only by supposing that light has a transverse vibration, since if light were moving in the same direction as the ray there would be no change.

Let us now interpose between the polariser and the analyser in the extinction position a sheet of a crystallised substance, *e.g.*, a sheet of gypsum having an unequal thickness between one end and the other and obtained by the cleavage of a crystal of gypsum. Crystallised matter possesses the property of causing a profound disturbance in the direction of the vibrations of light which it receives. The vertical vibration falling upon it will be rendered partly horizontal, thus allowing light to pass. But since this effect is unequal in extent in the case of light rays of different colours, very vivid colours will frequently make their appearance. Thus we shall see certain areas of the gypsum appear upon the screen as red, others as green, and still others as yellow. Each thickness of the gypsum will give a different mixture of colours.

Now if we turn the analyser at a right angle the light which passed in the previous experiment will be arrested and *vice versâ*, so that in the second part of the experiment we shall obtain the colours which are the exact complement of those in the first, since the *ensemble* produced white light.

Instead of observing these two aspects of the light successively we can obtain them simultaneously side by side upon the screen, in which case we see clearly that a green area in one corresponds to a red area in the other and so on.

Several objects made from another crystalline substance—mica—such as the petals of a flower and the wings of a butterfly, are formed of sheets of mica of different thicknesses; when we place them between the polariser and analyser we see the image of the butterfly or of the flower appear in colours upon the screen, and when we throw them upon the screen side by side at the same time we shall have a butterfly and a flower tinted in complementary colours.

The phenomena due to the transverse nature of vibrations and the possibility of separating these into different directions around the ray of light are very various in nature. Instead of obtaining the re-appearance of the light by placing between the

* From an address at the Congress of the Union of the Industrial Societies of France.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

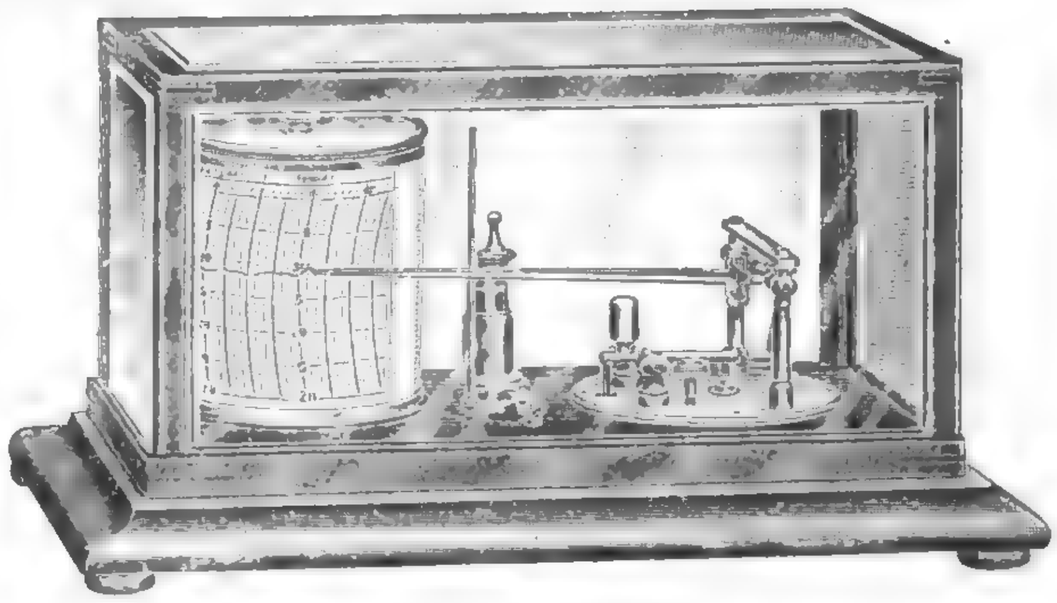
A POPULAR BAROGRAPH

of S. & M. Quality.

This first-class Recording Barometer combines an unusually high degree of accuracy with very moderate price. The Vacuum movement is concealed beneath the base plate, the whole construction being typically "S. & M." in simplicity and reliability. Available for prompt delivery, either in oak or mahogany case with glass cover, eight day clock and one year's supply of ink and charts.

The world-wide reputation of "S. & M." Scientific Instruments entails no penalty to the Retailer. Every sale shows a handsome profit.

Write for full particulars, terms and general booklet.



S. & M. No. 2318.

SHORT & MASON, Ltd., Aneroid Works, Walthamstow, London, E.17

TRY KIRK BROTHERS WHOLESALE & MANUFACTURING OPTICIANS FOR

OPTICAL REQUIREMENTS OF EVERY DESCRIPTION.

SPECTACLES and EYEGLASS FRAMES
RIMLESS MOUNTINGS
REPAIR MATERIAL
EYEGLASS CHAINS

TORTOISESHELL, HORN, XYLO and SHELLITE FRAMES
LORGNETTES
CASES
MOTOR GOGGLES, etc.

UNCUT LENSES WHITE or CHANCE'S CROOKES GLASS

SPHERES, BI or PERIS
ROUGH CYLINDERS
PLANO CYLINDERS
SPHERO CYLINDERS

CEMENT SEGMENTS
MENISCUS
TORICS
ROUGH TORICS, etc.

OUR RX DEPARTMENT IS UNEQUALLED FOR PROMPTNESS & ACCURACY.

Telephone: HOLBORN 1620 (Private Exchange).

KIRK BROTHERS WHOLESALE & MANUFACTURING OPTICIANS

Telegrams: KIRBROREX, HOLB. LONDON.

36, GRAY'S INN ROAD, LONDON, W.C.1

Digitized by Google Original from THE OHIO STATE UNIVERSITY

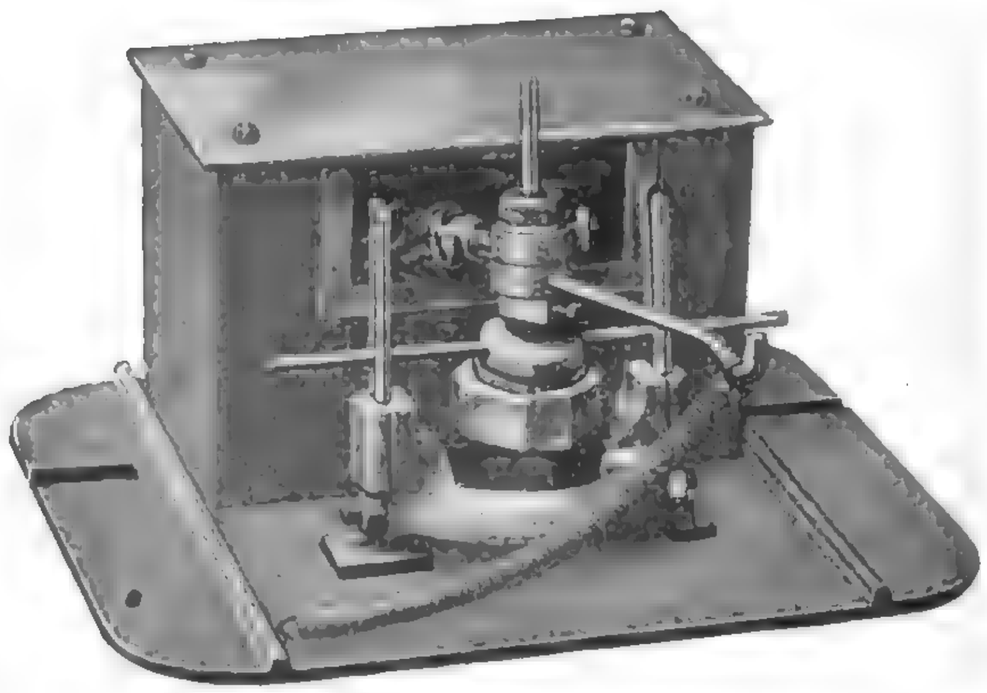
"SOMCO"

AUTO-SURFACING MACHINE.

PATENTED IN
GREAT BRITAIN
U.S.A.
FRANCE
GERMANY.

LONDON
MADE.

Ask for Quotations.



Requires Only 1/6 H.P.

TOOLS
GAUGES
SURFACING
SHOP EQUIPMENT
OPTICAL MACHINERY & INSTRUMENT REPAIRS.

SURGICAL & OPTICAL MFG., Co.,
22, Union Road,
Clapham, London, S.W. 4

THE
GLASSIE
LENS CLEANER

The "Glassie" Lens Cleaner is a neat advertiser for opticians.

It does its work THOROUGHLY:

A. It polishes.
B. It advertises.

Many opticians say it brings more business than their name blazoned in gold on a case does.

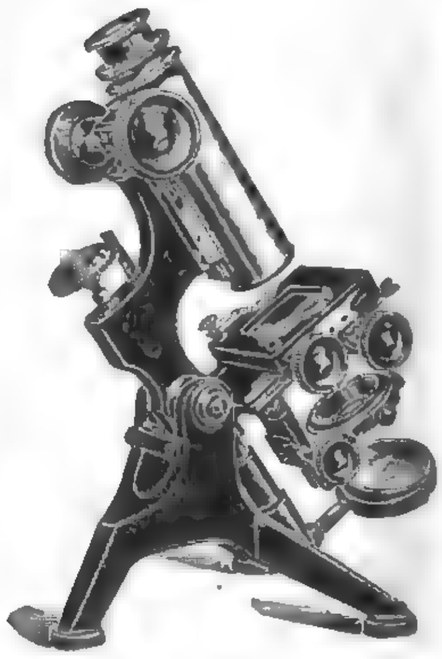
All progressive Houses have "Glassies."

Samples and Prices from your Jobber or direct from

THE GLASSIE LENS CLEANER Co
156 CHARING CROSS ROAD. LONDON. W.C.2.

SELL WATSONS' BRITISH-MADE
MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,
313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1937.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

polariser and the analyser a sheet of crystalline substance, we may arrive at an analogous result by using a parallelopiped of ordinary glass.

We can accomplish this by imparting to the glass artificially optical properties which vary with the direction. This is done by exerting strong pressure upon the glass, in which case the compressed glass acts like a crystal and the direction of the pressure exerted corresponds to one of the axes of this crystal. And we find that the stronger the pressure exerted upon the glass the more intense the light which reappears. And by studying this phenomenon mathematically we can even deduce the exact distribution of the internal tensions of which the substance is the seat. And it has been found possible to find an optical solution of delicate problems with respect to the resistance exhibited by various materials, by reproducing in glass pieces of metallic framework which are difficult to calculate, and then exerting upon the glass tensions or stresses identical with those to which the pieces of metal are subjected.

Chilled Glass.

These tensions are also encountered in tempered glasses, *i.e.*, glasses which have been heated to a red glow and then cooled with sufficient abruptness to cause the surface to regain its rigidity first. We examine between the crossed analyser and polariser a series of such specimens of glass, and we shall see that the very vivid play of colours observed gives a faithful image of the state of internal tension of the different areas.

Finally, we know that quartz crystals share with certain compounds of organic chemistry a certain property which has provided chemists with a key to the asymmetries of the molecule, namely; the power of rotation. But in the quartz this rotatory power, which is manifested in full perfection only in the direction of the axis of the crystal, is a result of the crystalline structure. In the crystal of quartz the successive vibrations of the light are arranged like the steps of a winding staircase. If we interpose a plate cut from a crystal of quartz between the polariser and the analyser in the extinction position the rotation which it imparts to the vibrations will have the effect of producing a luminous movement which the analyser will allow to pass. And since the rotation is unequal for the different parts of the spectrum the re-established light will exhibit colours. Indeed, the colours due to the power of rotation are among the richest which we know how to produce.

The artifice which we have already employed will give us a colour and its complement at one and the same time, and since it is easy to superpose the two images we shall again see white light reconstituted by each couple of coloured areas—blue and orange yellow, red and green, salmon and greenish blue.

[To be concluded.]

From Messrs. W. Ottway & Co., Ltd., Orion Works, Ealing, London, W., we have received an attractive wall calendar. This carries on the border half-tone illustrations of some of the many optical and mathematical instruments manufactured by the firm.

Very pleasant and instructive evenings were spent on Friday and Saturday last week, by a great number of students of the Northampton Institute (and their friends), who were entertained in connection with the Annual Prize Distribution. Organ recitals, gymnastic displays, dancing and a promenade concert were among the social features; and a number of demonstrations with the ordinary teaching apparatus of the Institute laboratories were arranged for those more seriously inclined. The whole of the elaborate equipment of the Institute was thrown open to inspection by visitors. Prizes and certificates were presented by the Rt. Hon. Lord Southwark, P.C.

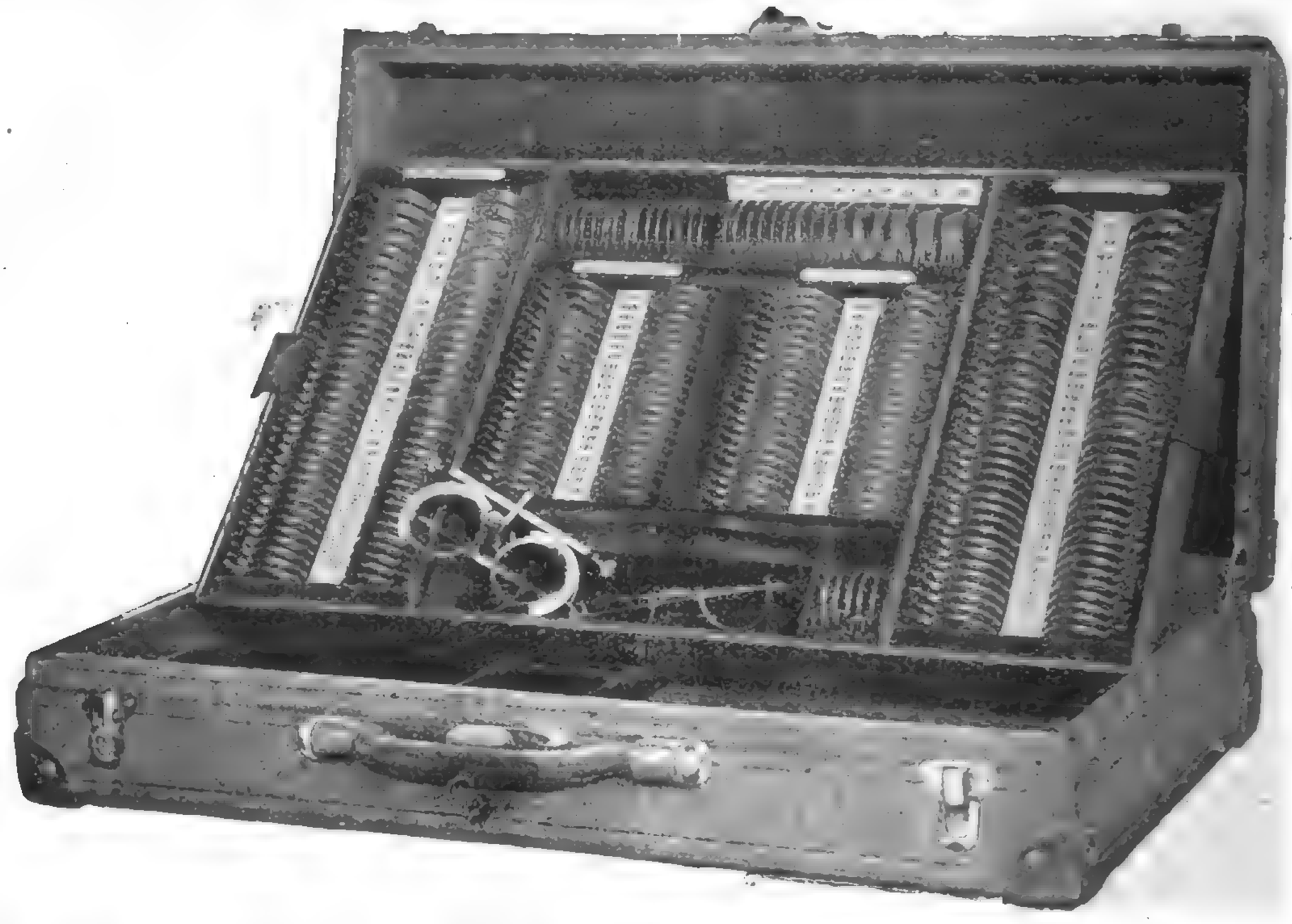
New Companies.

H. Motson & Co., Ltd.—Private Company. Capital, £100 in £1 shares. To carry on the business of chemists, opticians, etc. The first directors are:—H. Motson, ophthalmic optician, and J. R. Morris, pharmacist. Qualification: 1 share. Registered office: 25, Pownall Crescent, Colchester.

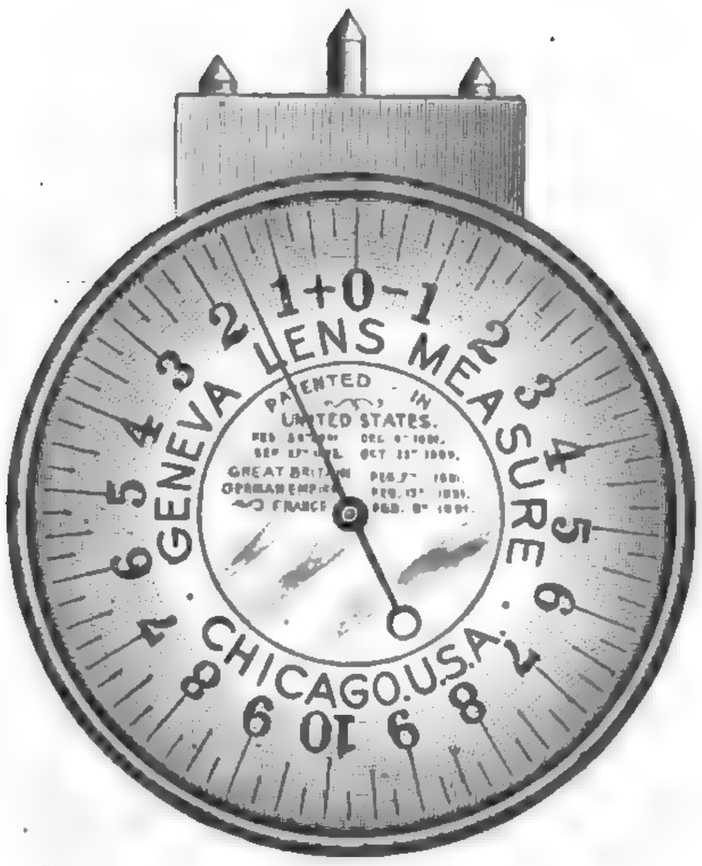
Thomas Evans & Son (Pendleton), Ltd.—Private Company.—Capital, £1,500 in £1 shares. To take over the business of chemists, photographers and photographic material printers, formerly carried on by T. Evans in Whit Lane, Pendleton. The first directors are:—H. N. Evans, (permanent governing director), 7, Whit Lane, Pendleton, and J. Jones, Claremont Road, Pendleton. Qualification: 100 shares. Remuneration of H. N. Evans £350 (with an additional £150 per annum as governing director); of J. Jones, £250 per annum. Solicitor: E. L. Barritt, 41, John Dalton Street, Manchester.

Matter intended for the current weeks' "Optician" must reach this office on the Tuesday morning preceding publication.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



TRIAL CASES in a Variety of Styles Best Finish



LENS MEASURES.

Retinoscopes, Ophthalmascopes, Corneascopes, etc., etc.

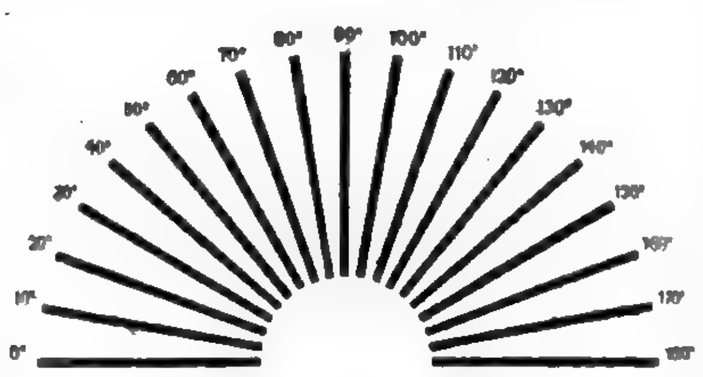
All kinds of Sight-Testing Requisites.

Immediate Delivery from Stock.

Prices Moderate.

SPECIALITIES.

The 'Optrex' Lens Finder
The 'Optrex' Face Measuring Rule.
The 'Optrex' Axis Finder
TIME SAVERS.



D-24
E D B
D-18
O N P Z
D-12
R C P B D
D-9
N S R E F P
D-6
H O C L Z W E
D-4.5
F F T D E O S L
D-3
L E F I E V D S

Large variety of Test Cards for Distance or Reading.

Special Folding Carrying Cards

JOHN BAIRD,
Manufacturing Optician,
Telegrams: "SPECTACLES, GLASGOW."

"HERALD" OPTICAL WORKS,
68 & 70, MITCHELL ST., GLASGOW.
Telephone: CENTRAL 541.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

DEPENDABILITY



One of the strongest reasons why far-seeing opticians have been specifying Shur-on gold filled spectacle frames is because of their downright dependability.

They have fully appreciated the fact that a thoroughly dependable frame was one of the surest ways of winning the confidence, future custom and goodwill of their patrons.

Since 1864—dependability along with "Quality Beyond Question" have been two of the cardinal principles upon which Shur-on frames have been built.

Be critical—say "SHUR-ON" to your wholesaler.

Shur-on Optical Co.,

Rochester, N.Y., U.S.A.

Shur-on Products

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

PRESCRIPTION SPECIALISTS.

Midland Lens Co ltd

ALSO UNCUTS. TORICS A SPECIALITY.
DALE STREET, COVENTRY..



OPTICAL BLOCKS

To illustrate all features of Optical Service. Write for Lists.

Chemists' Design Service,
12, Humberstone Gate, Leicester

PERCY S. DE SAULLES.

Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES.
Micro Cover Glasses, Glass Cells and Cavity Slips, etc.

The Platts, Amblecote, Stourbridge.

Sight Testing Apparatus
of all descriptions
SECOND-HAND
Fully Guaranteed.
WRITE TO-DAY FOR SECOND-HAND LIST.
Estab. 1657

W. P. THOMPSON.
F.C.S., M.I.Mech.E., F.I.C.P.A.
C. G. DYMOND,
M.I.Mech.E., F.I.C.P.A
W. P. THOMPSON & CO.,
12, CHURCH STREET, LIVERPOOL.
Chartered Patent Agents.
H. E. POTTS,
M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG.
M.T.I., F.I.C.P.A.

T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and AERONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
ESTABLISHED 1878 TELEPHONE CITY 419

Scientific Instrument Makers.

MICROSCOPES of all kinds manufactured at our own works.
REPAIRS to Prismatic and other Binoculars etc., promptly executed.

H. H. SHARLAND (H. KEMP),
9 & 10, THAVIES' INN, HOLBORN CIRCUS, LONDON, E.C.
Tel.: Holborn 4840. Established 1860.

Every Description of Ophthalmic Supplies.
All Requirements of the up-to-date Sight Testing Optician.
Good Special Lines at keenly Competitive Prices.

F. BARKER & SON, LTD.
SUNDIAL HOUSE,
12, Clerkenwell Road, LONDON, E.C. 1
Registered
Trade Mark
Estab. 1848
MANUFACTURERS OF ALL CLASSES OF
SCIENTIFIC AND OPTICAL GOODS.
MANUFACTURERS OF
Aneroid Barometers, Compasses, Drawing, Mining, Surveying & Scientific Instruments of Every Description.
Illustrated and Descriptive Catalogue Post Free to any part of the World. Illustrated Booklet upon Sundials, Barometers and Compasses, Post Free. LISTS FREE.
Correspondence Invited. Bankers' and Trade References.
CLINICAL THERMOMETERS A SPECIALITY

THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER

Subscription Form. 123-125, Fleet Street, London, E.C.4., England.

Send a copy each week of THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER post free for which we enclose .....shillings for.....weeks.

UNITED KINGDOM 17s.
and ABROAD 20s.

Name.....
Business.....
Address.....
.....

A remittance of 17s. (or 20s. Abroad) for 52 issues includes "THE OPTICAL ALMANAC" post free.
Cheques made payable to The Hatton Press Ltd.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

STRENGTH

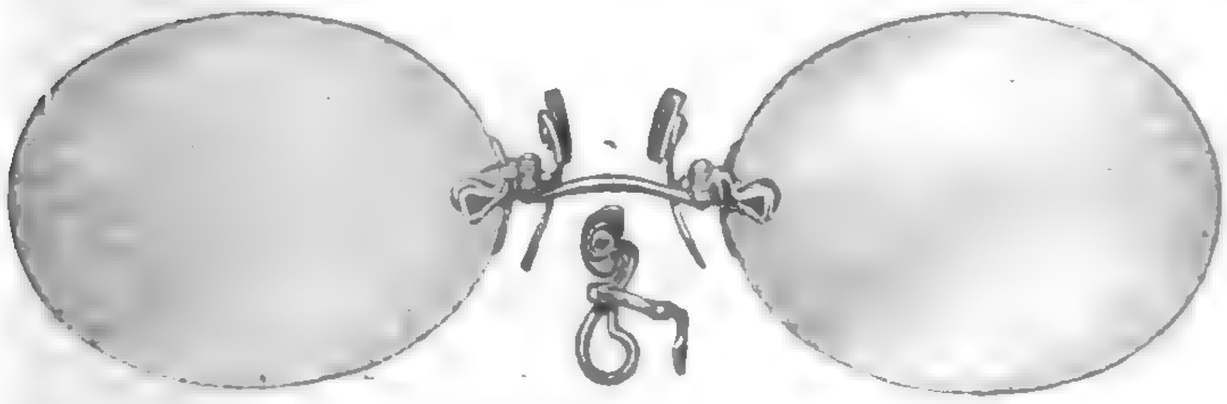
Strength is an important element of Realfit Finger Piece Mountings and Frames. That's one reason for their popularity. They give consistent service year after year.

Realfit Finger Piece Mountings wear longer and give greater satisfaction. The extraordinary care exercised in their manufacture, the materials which are used throughout, and the five inspections which every Realfit undergoes before being pronounced ready for shipment, all tend to assure STRENGTH, accuracy and neatness of appearance that is far from ordinary.

REALFIT OPTICAL PRODUCTS NJ



REALFIT *Finger Piece.*



Made in a complete assortment of Guards. Ask your Wholesaler.

NEW JERSEY OPTICAL Co.,
Newark, N.J., U.S.A.

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

The Key to Successful Business is the Trade Paper.

If you advertise, the trade paper gives you a 100 per cent. market; all the readers have a direct business interest in your goods, there is no waste circulation.

If you subscribe, it gives you the latest trade news and technical information. To-day, it is more necessary than ever to be up-to-date in your business; the trade paper will keep you posted. Here are some progressive journals which offer you valuable service as an advertiser, or as a reader.

Aeroplane (London).
Agricultural Gazette (London).
Art Trade Journal (London).
Auto-Cyclist (Sydney).
Automobile Engineer (London).
Auto-Motor Journal (London).
Baker's Confectioners' and Caterers' National Association Review (Lond.)
Bioscope (London).
Box Makers' Journal (Manchester).
Brewers' Gazette (London).
Brick and Pottery Trades' Journal (London).
British and Colonial Mineral Water Trade Journal (Cardiff).
British and Colonial Pharmacist (London).
British Baker (London).
British Builder (London).
British Journal of Photography (London).
Chemical News (London).
China Clay Trade Review (London).
Confectionery Journal (London).
Cooper's Vehicle Journal (London).
Corn Trade News (Liverpool).
Dairy & Creamery Journal (London).
Dairyman (London).
Decorator (London).
Drapers' Organiser (London).
Electric Vehicle (London).
Electrical Industries and Investments (London).
Electricity (London).
Electrics (London).
Engineering Production (London).
Engineering Review (London).
Engineering World (Manchester).
Fancy Goods Record (London).
Fertiliser and Feeding Stuffs Journal (London).
Flight and The Aircraft Engineer (London).
Footwear Organiser (London).
Freemason and Masonic Illustrated (London).
Furnishing Trades' Organiser (London).
Furniture Record and the Furnisher (London).
Games and Toys (London).
Gas and Oil Power (London).
Hardwareman and Ironmonger's Chronicle (London).
Ice and Cold Storage (London).
India Rubber Journal (London).
Indian Industries and Power (Bombay and Calcutta).
Indian Medical Gazette (Calcutta).
Indian Motor News (Bombay and Calcutta).
Indian and Eastern Engineer (Calcutta).
Journal of Decorative Art (Manchester).
Licensing World (London).
"Locomotive" & Railway Carriage and Wagon Review (London).
Managing Engineer (London).
Marine Engineer & Naval Architect (London).
Mechanical World (Manchester and London).
Milling (Liverpool).
Model Engineer and Electrician (London).
Motor Cycle and Cycle Trader (London).
Motor Export Trader (London).
Motor in Australia (Sydney).
Motor Magazine of Canada (Toronto)
Motor Trade of Canada (Toronto).
Motor Trader & Review (London).
Motoring in South Africa (Cape Town).
Motorist & Wheelman (Perth, W.A.).
Music Trades Review (London).
N.Z. Motor Journal (Auckland, N.Z.).
Optician and Scientific Instrument Maker (London).
Organizer (London).
Outfitter (London).
Paper Box and Bag Maker (London.)
Paper Container (London).
Paper Maker & British Paper Trade Journal (London).
Photographic Dealer (London).
Power Laundry (London).
South African Motorist (Johannesburg).
South Australian Motor (Adelaide, S. Australia).
Sports Trades Journal (London).
Stationery World and Fancy Goods Review (London).
Steering Wheel (Brisbane).
Stone Trades' Journal (London).
Sugar Journal, International (London).
Talking Machine News (London).
Textile Manufacturer (Manchester).
Textile Mercury (Manchester).
Textile Recorder (Manchester).
Toyshop and Fancy Goods Journal (London).
Waste Trade World (London).
W.A. Motorist (Perth, W.A.).
Wireless World (London).
World's Carriers' & Carrying Trades' Review (London).

The address of any Paper in this list may be cbtained from the Secretary of the

British Association of Trade & Technical Journals, Ltd.,

Sicilian House, Southampton Row. **London, W.C. 1** **Telephone No.: Holborn 395**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Pin your faith to L.O.C. for all your Rx Work and you will have frequent cause for self-congratulation.

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris. France.

Also at—2, Str-Bursei, Bucharest, Roumania.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d. per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

WANTED. Glazing plant, second-hand, conditions immaterial. Palmer, 209, Osborne Road, Brighton.

FOR SALE. Half-plate stand camera, mahogany, 10" ext. Beck-Steinheil Unofocal Ser. 1., No. 5. f/6 with Beck Celverex shutter, T.B. to 1/80 sec., 3 mahogany double dark slides, stand, focusing cloth, waterproof case, the whole £3 10s. Also ¼-plate Holborn reflex, magazine 12, Ilex, R.R. f/77. T. and I. to 1/100 sec. Leather case, £2. Please address, Box 3508, c/o "The Optician," 125, Fleet Street, E.C.4.

AUSTRALIAN OPALS. Direct from Australia. Single stones or quantities. Beautiful colours. Lists free. Optical goods or scientific instruments in exchange. Correspondence invited. Seward, Optician, Melbourne, Australia.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

WANTED. Genuine sight-testing business, London or South Coast preferred, partnership considered. Box 3509, c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 8*

TRAVELLING Representatives required by progressive London house, for Midlands, North of England and Scotland. Applicants must be resident on the ground and have had travelling experience. Reply, giving full particulars, which will be considered confidential, to Box 5782, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST, age 28, requires position with retail optician, awaiting result of B.O.A. examination. 6 years' sight-testing experience and thorough knowledge of photography. C.R., 76, Charlwood Street, Pimlico, S.W.

D.B.O.A. London man of good address, over 15 years' experience, expert in sight-testing and fitting, smart salesman, at present managing branch, seeks change, similar capacity. South Coast or London preferred. Box 5784, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, age 19, requires position, good testimonials. Able to do all Rx work, repairs, and attend customers. Would be indispensable to retail optician doing own jobbing. J. Gasson, 52, Battersea Park Road, S.W.11.

ALL-ROUND Jobber, rimless fitter and V-edge, etc., seeks situation in Glasgow. Box 5783, c/o "The Optician," 125, Fleet Street, E.C.4.

FINEST
ROUGH CYLINDER BLANKS,
Also good 2nd Selection
A very attractive proposition for Export and cheaper work.
CHANCE'S GLASS USED.
ACTUAL MANUFACTURERS
ASSOCIATED OPTICAL WORKS, Ld.
5, Queen's Buildings, London, W.1
Near Tottenham Court Road.
No Connection with any other Firm. Telephone: Museum 2216.

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.
STERLING ACCEPTED AT PAR.
COMMERCIAL OPTICAL Co.,
DANDURAND BLDG., MONTREAL.
Cable "Optical" A.B.C. Code 5th. Edition.

The Society of Chemist-Opticians.
President: Mr. F. S. Horsey
Vice-Presidents Mr. Fouracre.
Hon. Secretary: Mr. J. Harcombe Cuff, Friern Barnet Rd. New Southgate, N. 11 Telephone Finchley
THE SUPPORT OF ALL CHEMIST-OPTICIANS IS EARNESTLY INVITED.

SPECTACLES & EYEGLASSES.
Their Forms, Mounting and Proper Adjustment
by R. J. PHILLIPS, M.D.
Fourth edition revised with 56 illustrations.
Price 6s. 6d. Post Free 7s.
THE HATTON PRESS, Ltd., 125, Fleet Street, London, E.C.4

Candidates for the Examination of the Worshipful Company of Spectaclemakers can always be certain of receiving the most thorough and painstaking preparation at
THE SCHOOL OF OPTICS, LTD.,
Under the direction of Mr. LIONEL LAURANCE (Official instructor to the Company) and Mr. H. OSCAR WOOD.
General Optics, Visual Optics and Sight Testing.
The percentage of successful students AT THE FIRST ATTEMPT is consistently high.
Correspondence Courses, Afternoon and Continuous Day Classes.
Particulars on application to—
2, GUILFORD PLACE, LONDON, W.C.1

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Don't tolerate it!!

If in your opinion your work is not being returned as fast as might be —just try the Willesden Way.

▪ ▪ ▪ ▪

Address your next box of jobbing to W.O.W.—see what they can do.

▪ ▪ ▪ ▪

You have the Willesden guarantee for quality—all the time, and the difference in price is in your favour.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY:
DUDDEN HILL LANE, N.W.10

RADIUM COMPOUND

SELF-LUMINOUS.

Highest Possible Efficiency, Durability and Value.

As supplied to H.M. Government, &c.
Guaranteed to pass N.P.L. requirements.
All Grades in stock, from 15/- per gram.
RADIUM SALTS TESTED AND CERTIFIED.

F. HARRISON GLEW THE RADIUM LABORATORY,

156, Clapham Road, London, S.W.9

BRITISH OPTICAL INSTITUTE, LTD.,

(College of Optics).

Complete Training for the Sight-Testing Optician.

Supplementary to the usual Daily Classes and Correspondence Courses, a series of Evening Classes is held, for those desirous of preparing themselves for any of the Optical Examinations.

A Course of Weekly Evening Lectures, and Demonstrations, for candidates for the F.B.O.A. Examination, and for post-graduates, has also been arranged.

Clinical Classes.

are held on two afternoons a week, and give Students the special advantage of meeting actual cases, generally of particular interest.

The whole work of the Institute is carried out under the supervision of the Principal, assisted by Mr. Geo. Colebrook, F.B.O.A., F.S.M.C., (Master's Prizeman).

For full particulars apply to:—The Principal, Dr. MAX COGUE, B.Sc., Fern Lodge, 20a, Grove Road, Brixton, S.W.9
Telephone: Brixton 677.

VISUAL OPTICS & SIGHT-TESTING

By LIONEL LAURANCE.

A New Edition, just out. Price 21s. 21s. 9d. post free.

GENERAL AND PRACTICAL OPTICS

By LIONEL LAURANCE.

A New Edition. Price 21s. 21s. 9d. post free.

The two ideal books for the acquirement of a knowledge of the subjects indicated by their titles.

THE HATTON PRESS, Ltd.,
125, Fleet Street, London, E.C.4

The Optician's Handbook.

Price 4s. 0d. Post Free.

An elementary text book required by every student of Optics.

It is an introduction to "The Study of the Refraction of the Eye, its Anomalies and their Estimation and Correction by means of Glasses.

The Hatton Press, Ltd.,

125, Fleet Street, LONDON, E.C.4

Telephone JAMES B. SLY, Central 10290.
9 & 10, EDWARD ST., WARDOUR ST.
LONDON, W. 1

To S.M.C., B.O.A. & I.O.O. DIPLOMA HOLDERS

Oak frames and modelled gold Arms for the diplomas The Arms of the S.M.C., City of London, and devices of the I.O.O., B.O.A. and Ph. Society in water colours, and framed dark oak, with descriptive engraved plate affixed, 27/6 each. Packed and put on rail.



Printed & Embossed Optical Stationery.

Steel Dies for use of Diploma Holders.

Electros of Coat of Arms & Optical Devices.

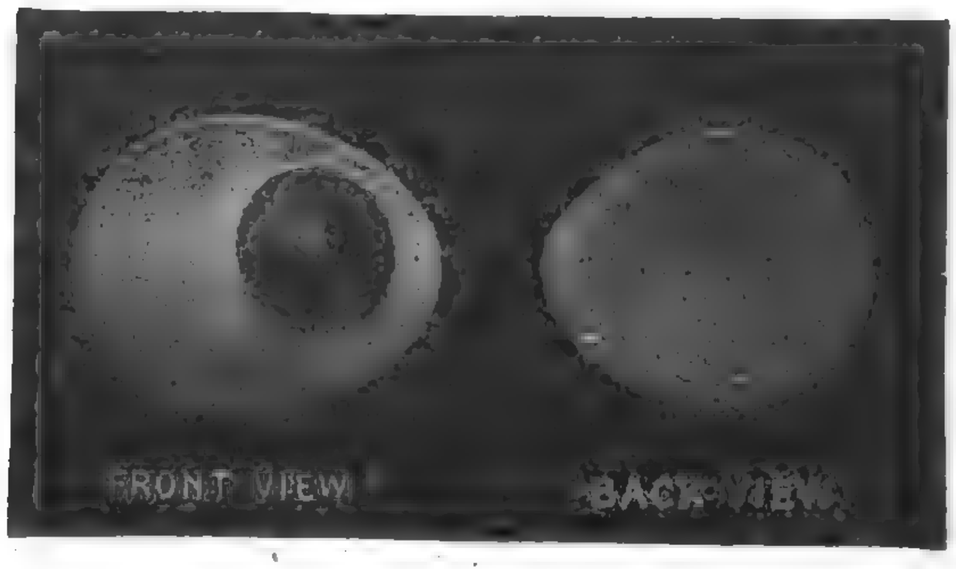
Engraved Seals, Prescription Forms, Signs, etc.

Price List on application.

Electro No. 12 Price 3/6

SNELLEN'S IMPROVED ARTIFICIAL EYES

PACHE & SON, 75, Station St., Birmingham.



MAKERS TO THE PRINCIPAL HOSPITALS.
Selections sent to Surgeons. Also Makers of the ordinary Shell Ey

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

The Employment Bureau.

***A*.—Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

JOBBER wanted to take charge of small workshop, with very good all-round experience. Reply, full particulars, wages. Benn Franks, 44, Saville Street, Hull.

JEWELLER-OPTICIAN'S Son, 21, passed major portion S.M.C., desires post with optician, London, where good practical experience can be obtained. Vennall, High Street, Chesham, Bucks.

QUALIFIED Opticians wish to recommend their first assistant. Good refractionist and salesman. First-class man for charge of prescription workshop. Box 5780, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT requires progressive berth. Passed S.M.C. examinations except one subject. Good refractionist and salesman. Can do all repairs. In or near London preferred. Box 5779, c/o "The Optician," 125, Fleet Street, E.C.4.

LADY desires post as clerk, 5 years' general office experience,, quick at figures, typing. Good references. Box 5778, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS rimless fitter and glazier, both bevel, shell and rimless, bifocal work, 11 years' experience, seek post. Box 5777, c/o "The Optician," 125, Fleet Street, E.C.4.

RAYNER OPTICAL CO., Kemptown, Brighton, have vacancies for edgers and checkers.

SITUATION required by good all-round man, well up in refraction and all repairs and rimless work. Also Kryptoks and cement bifocals. Able to take entire charge. Apply, Box 5781, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED Young Man required for London, with practical knowledge of scientific instruments (microscopes, etc.), for repair, demonstration and sale. Apply, Box 5785, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED for London office of lens manufacturer, young man with a knowledge of the wholesale trade to take charge of stock and call on customers. Apply, stating age, experience and wages required, to Box 5772, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, Qualified, wanted for sight-testing, knowledge of workshop, age about 25, London district. Send full particulars of experience, salary required and photo to Box 5765, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST, used to working class trade, good retinoscopist and salesman, 20 years' experience, open to engagement. Optician, 49, Hazlewood Avenue, Newcastle-on-Tyne.

REFRACTIONIST, young lady, age 25, thoroughly experienced in all branches of sight-testing, desires position as assistant to sight-testing optician. Used to sole charge. Midlands preferred. Box 5773, c/o "The Optician," 125, Fleet Street, E.C.4.

LOCUM TENENS disengaged, capable and experienced refractionist, thoroughly reliable and practical workman, used to management. Excellent credentials. Box 5774, c/o "The "Optician," 125, Fleet Street, E.C.4.

TORTOISESHELL worker requires berth. Good at general repairs, lorgnettes, spectacles, folders. District not essential. Box 5776, c/o "The Optician," 125, Fleet Street, E.C.4.

RETAIL or Wholesale position in London required by unqualified refractionist, 9 years' experience, including management of general optical trade. Good appearance and address, thoroughly reliable in every way. Studying for S.M.C., only reason for seeking change. Box 5771, c/o "The Optician," 125, Fleet Street, E.C.4.

SITUATION required by young lady with West End retail optician. Five years' experience with qualified optician, smart saleswoman, can neutralise, do small repairs and frame fitting. Reply, Box 5770, c/o "The Optician," 125, Fleet Street, E.C.4.

TORTOISESHELL frame maker wanted for Birmingham. Good wages and prospects for young man capable of taking charge. Box 5769, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION as branch manager or first assistant required in London or suburbs. Passed S.M.C. examination excepting one subject, careful refractionist O. & S. methods. Can do all repairs, also edging and fitting. Good all-round knowledge, own test case, etc. Box 5767, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED Refractionist (F.S.M.C.), keen and energetic, age 33, good address and appearance, desires engagement. Careful tester, with clinical experience, London or near preferred. Apply, Box 5766, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. experienced reliable manager desires change. Careful and expert refractionist (O. & S. methods), frame fitter, etc. Can assure employer of integrity, and thorough service. Box 5762, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACER (all-round) seeks situation (male). Box 5764, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED opticians required. Good experience and address essential. Excellent progressive positions offered. South Coast. Apply, Box 5761, c/o "The Optician," 125, Fleet Street, E.C.4.

LADY, age 23, seeks re-engagement in optical trade, 3 years' wholesale and 3½ years' retail experience. Birmingham essential. Box 5760, c/o "The Optician, 125, Fleet Street, E.C.4.

EXPERIENCED lens worker requires situation. Thoroughly used to all first-class prescription work. R. Talbot, 151, Monument Road, Ladywood, Birmingham.

EXPERIENCED Man, has organising ability, requires situation, good references. Apply, Box 5759, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS Refractionist, D.B.O.A., F.S.M.C., thoroughly reliable and accurate, requires position as branch manager or first assistant. Is not afraid of work or responsibility. Write Box 5758, c/o "The Optician," 125, Fleet Street, E.C.4.

QUICK, First-class, reliable rimless fitter seeks situation. Moderate knowledge of rimless and bevel edging. 8 years' experience. Apply Box 5757, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, 18, requires position to gain further experience of sight-testing, knowledge of cameras and materials. Box 5763, c/o "The Optician," 125, Fleet Street, E.C.4.

GOOD All-round jobber required with experience in rimless glazing. Box 5743, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED by qualified optician, responsible position offering scope for accurate refraction, first-class salesmanship and energetic organising. In or near London. Box 5752, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED Young lady required for prescription department. Box 5736, c/o "The Optician," 125, Fleet Street, E.C.4.

SOUND Refractionist, age 25, married, of good appearance and address, requires post. West End and provincial experience. "Sight," 47, Kenninghall Road, Clapton, E.5.

Concluded on page 6

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Are You Satisfied

that the abrasive you are now using gives you

The Best Possible Results?

If not, ask your wholesaler for trial samples of

"U.K." No. 4 and No. 5 Emeries and Rouge

You will be pleased with them and will require regular supplies. They are put up in tins of convenient size containing 5 lbs.

UNITED KINGDOM OPTICAL CO., LTD.,

(Wholesale and Export Only.)

MILL HILL, LONDON, N.W.7

Digitized by Google Original from THE OHIO STATE UNIVERSITY

THE OPTICIAN
Reg. at G.P.O. as a Newspaper

AMERICAN·OPTICAL·COMPANY, LIMITED



WINDSOR SPECTACLES.

Those who care for perfection in the little things of dress choose a pair of Wellsworth Windsors to complete a tasteful afternoon costume. Beautiful in their cherry zylo. setting, with a touch of bright gold in bridge and temple, they strike a note of distinction in Spectacleware which your customers will be quick to appreciate.

The Wellsworth Windsor construction is protected by British Letters Patent. Beware of infringements.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C.4. (Printed by The Century Press, Fulham, S.W.6.)

Digitized by Google Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT·MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1603 FRIDAY, DEC. 16, 1921.

FITS-U NARROW P.D. MOUNTINGS



No. 5142.

By using Wellsworth Fits-U Narrow P.D. Mountings No. 5142, you can fit a customer who requires a large eye size, with a lens 3 mm. larger than that which could be used with a regular bridge. The narrow p.d. mounting also tends to make the fingerpiece much neater and inconspicucus as well as lighter. The strength of the bridge is not sacrificed either, but is just as strong and serviceable as in other styles of Wellsworth bridges.

Your customers who want large lenses can be satisfied with Wellsworth Fits-U Narrow P.D. Mountings, and can be fitted correctly.

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

AMERICAN OPTICAL COMPANY, LIMITED,

39, Hatton Garden, LONDON, E.C.1

Reg'd at the G.P.O. as a newspaper PRICE 4d *Subscription post free 12 months 17s.*

Postage in United Kingdom 1d

Foreign Subscription including "Optical Almanac," post free 20s. *yearly.* *The Hatton Press, Ltd., 123-5, Fleet St., London*

Digitized by Google Original from THE OHIO STATE UNIVERSITY

THE

PATENT L. W. ORTHOPS 167902.



THE L-W ORTHOPS OPHTHALMOSCOPE

This new instrument is entirely reflecting and eliminates most of the difficulties of ordinary ophthalmoscopy; with the minimum of practice, an excellent view of the fundus is obtained.

The instrument is worked by an ordinary small dry cell battery, measuring $3\frac{1}{4}'' \times 3''$.

It is an instrument that should be possessed by every sight testing optician who wishes to make ophthalmoscope examinations.

It can be obtained from any Wholesale Optical House, from whom a fully descriptive pamphlet can be had on application.

Manufactured by **GEORGE CULVER, Ltd., London, N.1**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

"Stork"

Automatic Eyeglass

BRITISH MADE.

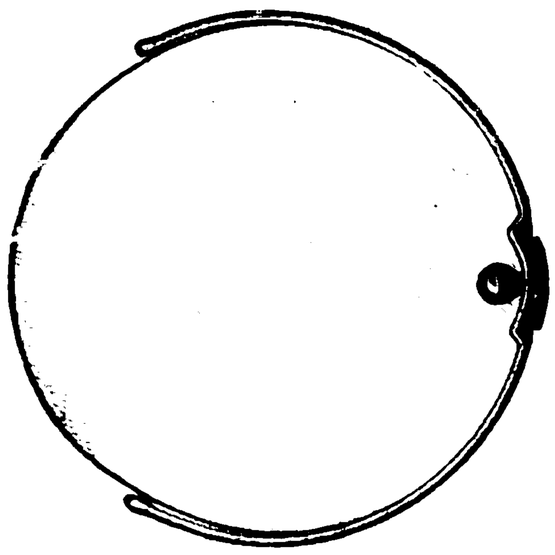
Holder

PAT. APPD. FOR

Constructed on an Entirely New Principle, this chain is Mechanically Perfect.

It embodies all the essentials of the reliable eyeglass holder and is a chain that can be recommended with confidence.

Strongly made yet neat and well-finished. Action combining simplicity with Certainty. Locking Bolt makes accidental recoil of chain impossible. British Made and reasonable in price. Chain can be worn at any length.



The "COURT" Invisible Gallery Oxford.

Adaptable to any Size or Shape of Eye.
Made in 9ct. Gold.

Rd. No. 682819.

Samples and prices sent on application to

WALTER H. THOMPSON,

: 66, HATTON GARDEN, E.C. 1 :

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713 (Two Lines).

A

Digitized by Google Original from THE OHIO STATE UNIVERSITY

J&R F LTD

Some Suitable Lines for the Season's Trade

Immediate delivery from Stock.

Reading Glasses — REAL TORTOISESHELL; LOTOSHELL; SHELLULEX; ALUMINIUM; AMOPTOSCOPES

Spectacle and Eyeglass Cases — TORTOISESHELL; SOLID SILVER; A.O.Co. POLISHED ALUMINIUM

Lorgnettes — TORTOISESHELL; LOTOSHELL; SOLID GOLD; SILVER GILT; ROLLED GOLD

All lines are well finished saleable goods. We keep no others.

J. & R. FLEMING LTD.,

Telephone:
HOLBORN {814, 815}
HOLBORN {2788, 2789} Prescription Dept.

136-148 Clerkenwell Road,
LONDON, E.C. 1.

Telegrams:
"OTTICO." LONDON.

Branches with Prescription equipment:

WALTER BRAHAM & Co. Ltd.
8, Key Hill Drive,
BIRMINGHAM.
Phone: Central 2509
Telegrams: "Brahma."

37, WESTGATE STREET,
CARDIFF.
Phone: Cardiff 44
Telegrams: "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1085.
Telegrams: "Ottico."

8, SHUDEHILL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

J&R F LTD

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
The Rt. Hon. VISCOUNT HILL, L.C.C.

Upper Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Renter Warden
HARRY HYLTON-FOSTER. Esq., Past Master.

Director of Examinations
The Rt. Hon. SIR WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in May, 1922.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,603

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, DEC. 16, 1921.

The Almanac.—Will any of those firms whose addresses, telephones numbers, etc., published in this year's *British Optical Almanac* may call for revision, kindly favour our publishers with a postcard giving the necessary corrections in the course of next week? While we have carefully revised the directory ourselves, and included a number of additional names of advertisers in *The Optician*, we shall be glad to have the additional safeguard of an intimation from any who have noticed inaccuracy in the existing list. These remarks do not apply to the directories of the Worshipful Company of Spectaclemakers, the Society of Chemist-Opticians, or the National Association of Opticians, which are official lists; and any communications respecting them should be addressed to headquarters of the bodies concerned. Intending advertisers in the 1922 Almanac are requested to be good enough to send all copy during the ensuing week.

* * *

Inadequate Prices.—In addition to letters published this week, we have received other indignant protests against the suggestion that opticians should handle cases of defective

Digitized by Google Original from THE OHIO STATE UNIVERSITY

sight which require spectacles, for an inclusive remuneration of five shillings. Of course, such a proposal can only be defended on the ground that it is done for persons deemed to be the recipients of charity—much as a good many doctors will examine and prescribe for poor patients at an inclusive 5s. fee. For an optician to see the majority of his customers for sight-testing and glasses on any such terms would spell bankruptcy, as is pointed out in one of the letters sent for publication. The issues now raised are matters that should be fully, and we think, quite openly canvassed by the whole of the various organised bodies of retail sight-testing opticians. The profits of retail opticians are being threatened by a numerically considerable organisation; and it would appear that the threat can only be met by organised action in reply. There would seem little advantage to be obtained by any policy of concealment; as what will tend to become a minimum price for sight-testing and spectacle fitting will be payable alike to the best qualified refractionist and to the worst incompetent. In this one matter of a minimum price, the interests of certificated and uncertificated members of the profession are the same. We shall be glad to publish everything useful that may be sent to us dealing with this subject, whether from individuals or official bodies representing the retail trade.

* * *

Visual Judgments.—Questions relating to optical illusions, through a novel mathematical method of investigating some of them, have been raised by two important contributions to *The Optician*. Such questions are of considerable interest to an ophthalmic optician, and their solution may be important, because many people are troubled by the fact that some visual judgments are distorted when using spectacles. Many others have complained that the glasses they require, or perhaps some particular form of such glasses, cause vague feelings of discomfort, which cannot be accounted for by the mechanical factors productive of eyestrain; and here possibly the discomfort arises from nothing more than some slight disturbance in the visual field. The introduction of best form lenses, which have been brought into such prominence by the researches of Mr. Whitwell has stimulated enquiry in this direction, as to the shape of lens giving most comfort in use besides good definition over a wide field. And every improvement in the designing of eyewear gives more of an advantage over others, to those refractionists who make a scientific study of their profession. If mathematical investigation into the aberrations of form vision can suggest new refinements in adapting aids to sight, that will be all to the good.

* * *

To speak of an optical illusion most commonly implies departure from that normal visual perception which is quite definite and constant for each individual. The normal sense is naturally evolved by co-education of the several factors in vision, as was first predicated by Locke, and is now common knowledge. And the various naked eye illusions—of size, shape, direction or distance—which are imposed by special features of the objective field, are easily accounted for in terms of normal vision. When changes are made affecting the optical system of the eye, however, as by interposing a fixed prism or lens, the whole basis of our visual perception is altered, as if the co-education of eye and brain had to begin over again. Fortunately, the difference is minute, and as a rule hardly noticeable. But the mathematical investigation above referred to proves that spectacle wearers (at least when first taking to their glasses) will see a plane surface as if curved. Should it be the case, as seems probable, that this illusion becomes weaker in the course of time, that would be a further argument for the earliest possible correction of ametropia.

* * *

Binocular vision is to be assumed, of course, when normal visual perception is spoken of, so that we have the familiar co-ordination of convergence and accommodation. (In the narrowed field of a watchmaker's eyeglass, illusions are few.) It would be interesting, however, to examine comparatively, subjective experiments with a man blind in one eye from birth or early childhood, or having one eye permanently thrown out of fixation with the other, owing to strabismus. Ordinarily, the two principal factors in judging distance are convergence and accommodation, of which it would seem that the first can mask the second to a great extent. Accommodation used varies from point to point of a plane object according to the secant of the angle from the midpoint, and according to the differences of such secants as the eye turns. In binocular vision, however, it appears that the relative inclinations of the eyes are the dominant factor, interference with which by means of spectacles gives curvature of a plane and presumably the corresponding distortion of a plane figure.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE PRINCIPLES AND PRACTICE OF POLISHING.

By Dr. J. W. FRENCH.

Last session I had the privilege of lecturing to the members of the Society on the subject of the Properties and Production of Optical Glass. To-night I wish to deal with the principles and the practice of the grinding and polishing of optical parts, and more particularly with the production of the highest class of multiple work.

It is fortunate for civilisation that there are available solid substances such as glass that are not only transparent, but which are capable of being worked and polished with ease and precision.

A polished surface is one whose texture is so fine in comparison with the wave-lengths of visible rays that it is capable of reflecting images that are well defined when the surface is in addition optically regular. Matt surfaces of comparatively coarse surface texture scatter the light and do not produce such images. There is a closer analogy between the surface of the sea and the surface of glass than is generally recognised. A well-defined image may be reflected from the calm surface of the sea, while only scattered light is reflected by the sand of the shore. If the surface of the sea is momentarily ruffled it will quickly return to its light reflecting condition, surface tension forces being one of the determining factors. When the surface of the sea is too rough to reflect a regular image the surface of each little depression will, however, still retain its polished surface. A polished glass surface is very like the calm liquid surface of the sea, in that it exhibits no visible structure. A ground glass surface, like the ruffled sea, does not reflect a well-defined image except at very oblique incidence. When examined under the microscope, however, it will be seen that the surface of each little hollow is itself structureless like that of a liquid.

Robert Hooke in his Micrographia, dated 1665, described in the following words the appearance of polished surfaces in those early days, but it is difficult to believe that the art of glass working was of so primitive a kind as Hooke's description implies. His words are as follows:—"Even in the most curious glasses for microscopes and other optical uses I have when the sun has shone well on them discovered their surface to be variously raz'd or scratched and to consist of an infinite of small broken surfaces which reflect the light of very various and differing colours, and indeed it seems impossible by art to cut the surface of any hard and brittle body smooth since Putte or even the most curious powder that can be made use of to polish such a body must consist of little hard rough particles and each must cut its way and consequently leave some kind of gutter or furrows behind it, and though nature does seem to do it readily in all kinds of fluid bodies yet perhaps future observers may discover even those also rugged it being probable as I elsewhere show that fluid bodies are made up of small solid particles variously and strongly moved and may find reason to think there is scarce a surface in rerum natura perfectly smooth."

About 30 years later Sir Isaac Newton in his treatise on Opticks also expressed very clearly this earlier conception of a reflecting surface. His account is worth repeating as an example of his wonderful power of precise description:

"For in polishing glass with sand, putty or tripoly, it is not to be imagined that these substances can, by grating and fretting the glass, bring all its least particles to an accurate polish, so that all their surfaces shall be truly plain or truly spherical and look all the same way so as together to compose one even surface. The smaller the particles of those substances are, the smaller will be the scratches by which they continually fret and wear away the glass until it be polished, but be they never so small, they can wear away the glass no otherwise than by grating and scratching it and breaking the protuberances, and, therefore, polish it no otherwise than by bringing its roughness to a very fine grain so that the scratches and frettings of the surface become too small to be visible."

Subsequent writers such as Coddington, Sir J. F. W. Herschel and Sir David Brewster did not hesitate to accept and repeat the statement of so authoritative an observer as Newton. Lord Rayleigh, when lecturing in 1901,

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

to the Royal Institution on the subject of Polish, first suggested the molecular character of a polished surface. He stated that "we recognise it is something of an accident



Fig. 1

that polishing processes as distinct from grinding are needed at all and we may be tempted to infer that there is no essential difference between the operations. . . But although, perhaps, no sure conclusion can be demon-

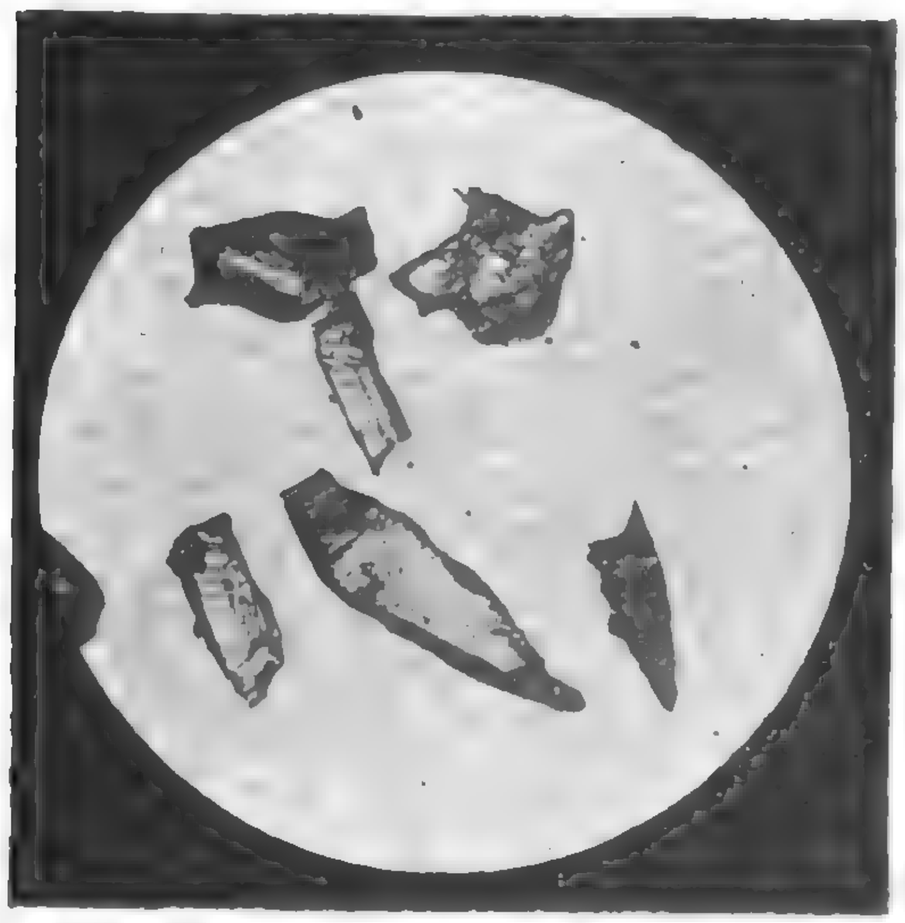


Fig. 2

strated, the balance of evidence appears to point in the opposite direction. . . Under those conditions which preclude more than a moderate pressure it seems probable that no grits are formed by the breaking out of fragments but that the material is worn away almost molecularly."

In a later paper, Lord Rayleigh refers to the remarkable pool like appearance of elementary polished patches of a glass surface which so many previous observers of renown had failed to record, and Sir George Beilby attributes the formation of the fluid like surface to surface tension forces acting upon the disturbed surface molecules. A microscopic examination of ground and polished surfaces affords strong confirmation of these opinions.

It will be interesting to consider first in detail the sequence of operations, namely, forming or rough grinding, smoothing and polishing, involved in the working of an optical surface.

The purpose of the forming operation is to

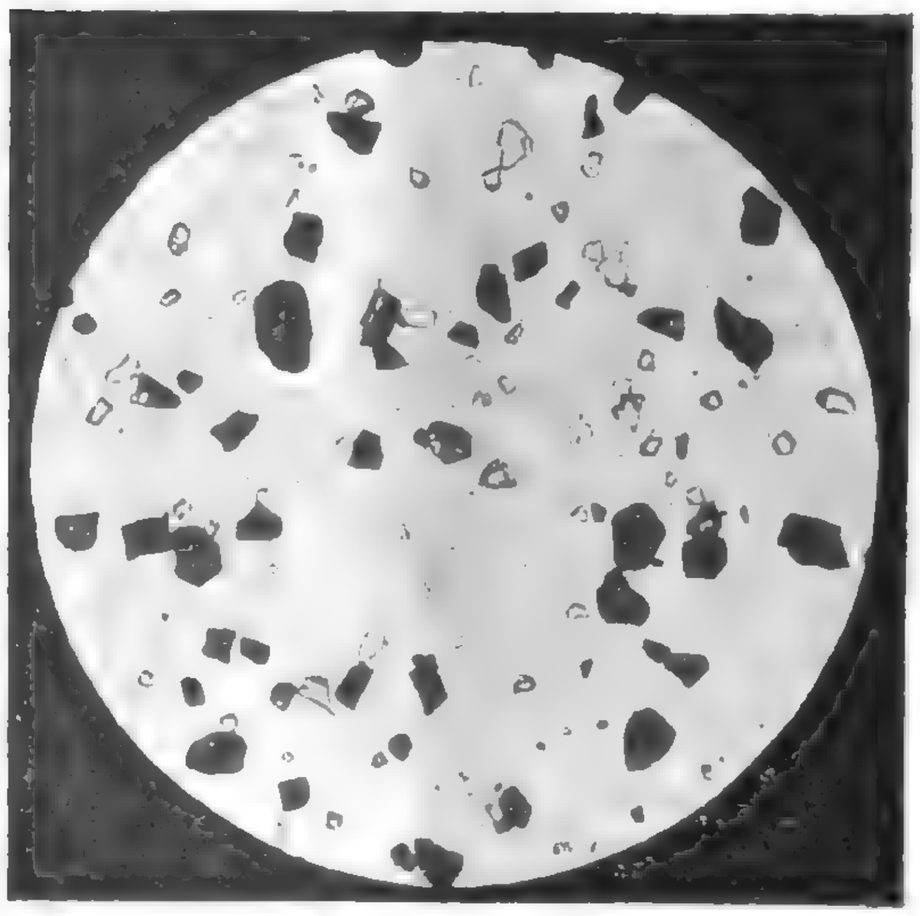
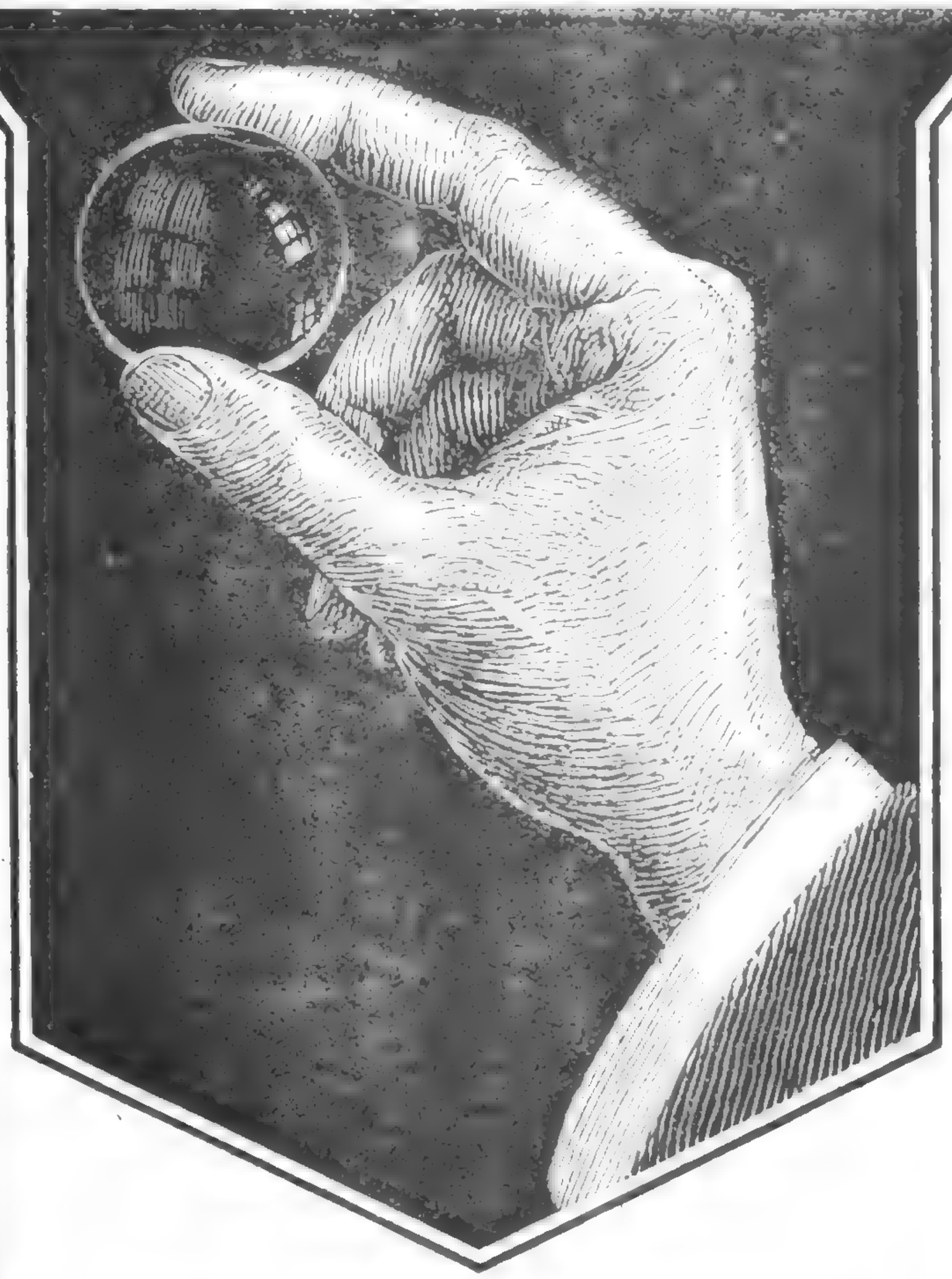


Fig. 3

reduce the block of glass to the required shape and size. Removal of material is, therefore, the principal requirement. For this purpose abrasives of different kinds are employed, the principal types being carborundum, corundum emery and sand. Grains of fresh carborundum are represented in fig. 1. It is an extremely hard abrasive being excelled only by the diamond splinters shown in fig. 2. Both substances are characterised by the irregular form of the grains, by their numerous corners, and the absence of any flat plate formation. Carborundum breaks down into smaller pieces of similar character, as indicated in fig. 3, which shows the result of three minutes' working. It does not, therefore, readily lose its cut and when rewashed it acts as a finer grade of abrasive.

Emery, grains of which are represented in

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



Seeing's Believing

There is a lot of truth in that homely old phrase, and it applies with particular aptness to Chance's "Crookes" Glass, the properties of which sound to the uninitiated so mysterious in print.
Encourage people to call on you for a demonstration of

Chance's 'CROOKES' Glass

CHANCE BROS. & Co., Ltd., Glass Works, Smethwick, Birmingham



An instrument is now on the market to demonstrate to the public the efficacy of Chance's "Crookes" Glass in cutting off the harmful light rays.

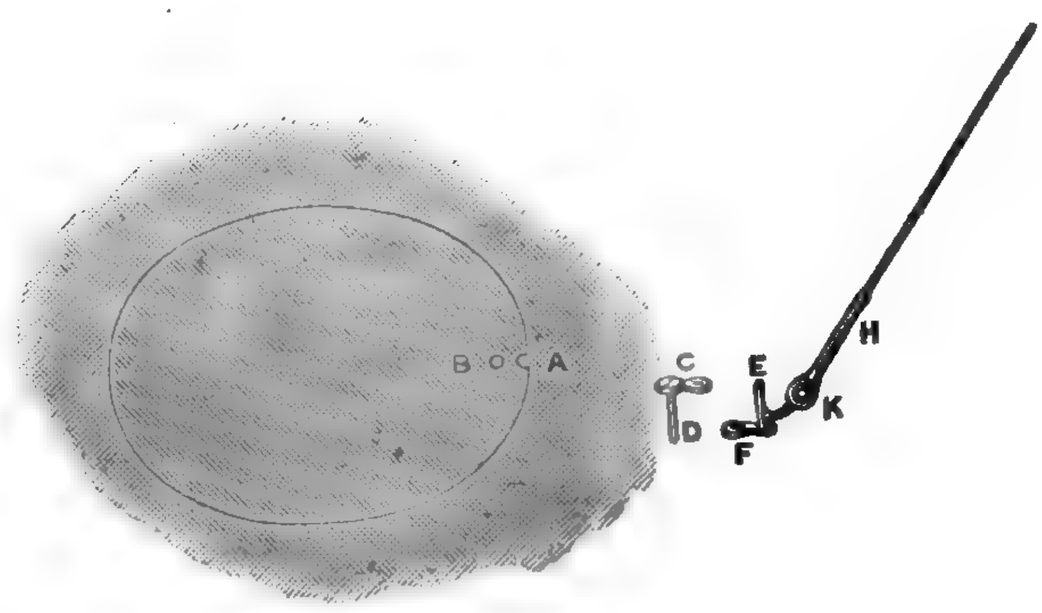
The late Sir William Crookes, O F.R.S., to whose researches was largely due the evolution of Chance's "Crookes" Glass.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Phone:—City 3225 (3 lines) *Telegrams :—Bulford, BARB. London.*

PATENT "INVISO" REG. MOUNTINGS

THE Patent "**Inviso**" method of attaching the mountings to the lenses lends itself to extreme lightness. This makes itself apparent in a marked degree in Spectacle mountings, since it obviates the placing of a bearing part of metal against the edges on the lenses, as in the regular form of fitting.



A—Slot in Lens. B—Hole in Lens. C—Loose Strap sliding on E.
D— Screw passing through Lens in fixed Strap F. K—Joint. H—Cable Curlside.

In illustration of lens it will be noted that a narrow slot A, is made in the lens parallel with the hole B, into which the fitted E sinks (Pat. No. 21944). Our patent No. 14888 also provides for a movable strap C so that the lenses of different thickness can be fitted. This in itself is a great advantage over the regular mounts, which being rigid cannot be fitted with the accurate precision which is so necessary when dealing with lenses of so many different thicknesses, which so often, are between the regular sizes made. The "**Inviso**" loose strap overcomes this and moreover a contact fit is made in all cases. The illustrations show the lightness and neat appearance over the regular form in use.

Made by the firm whose Reputation for Prescription Work is :—*"Second to None."*

NEWBOLD & BULFORD, ***Prescription House,***
GOSWELL ROAD, LONDON
E.C.1

Digitized by Google Original from THE OHIO STATE UNIVERSITY

fig. 4, is not so effective an abrasive as carborundum. It is not so hard and it loses its cut more readily. Being a natural substance usually containing impurities it tends to break



Fig. 4

down to a lamellar or flat form and thus to lose the cutting power associated with an irregular shape.

Grains of Fontainebleau, sand having a rounded wind or water worn appearance are

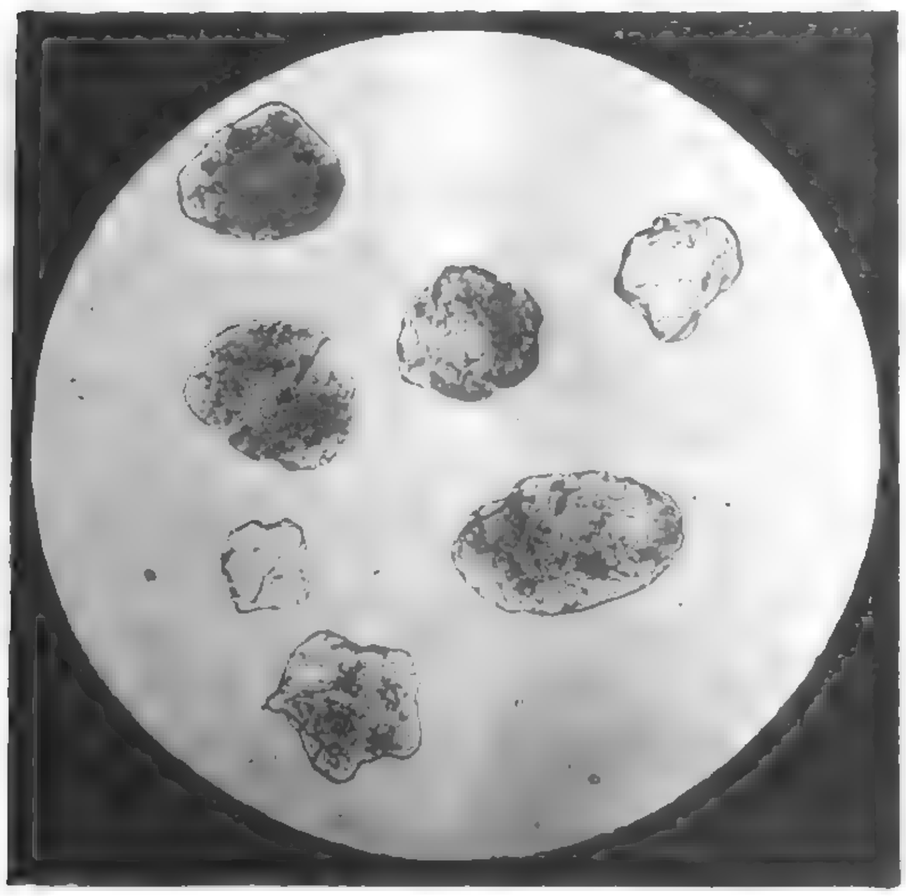


Fig. 5

represented in fig. 5. Sand quickly loses its cut by breaking down into more or less flat sided fragments as represented in fig. 6, which shows the grains after being in use for three minutes.

An abrasive to be effective must be hard, irregular in shape, and it must break down into grains of a similar shape.

In the operation of rough grinding innumerable conchoidal fragments of the material are

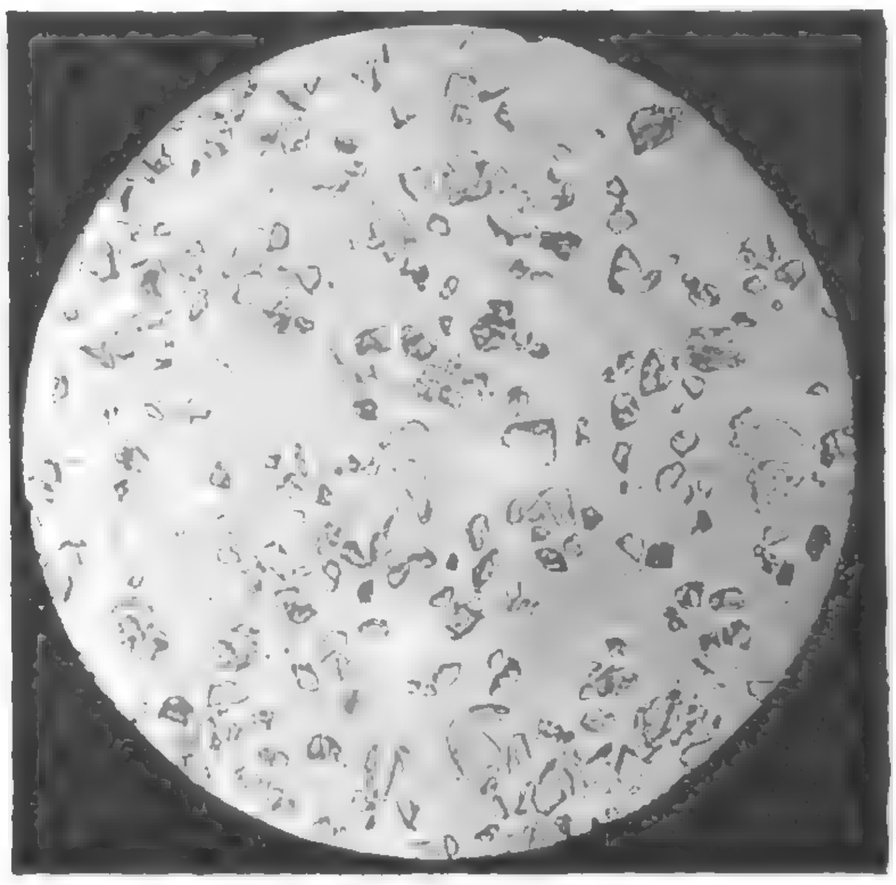


Fig. 6

removed by the abrasive, the ground surface when examined, under the microscope if necessary, having the appearance indicated in fig. 7.

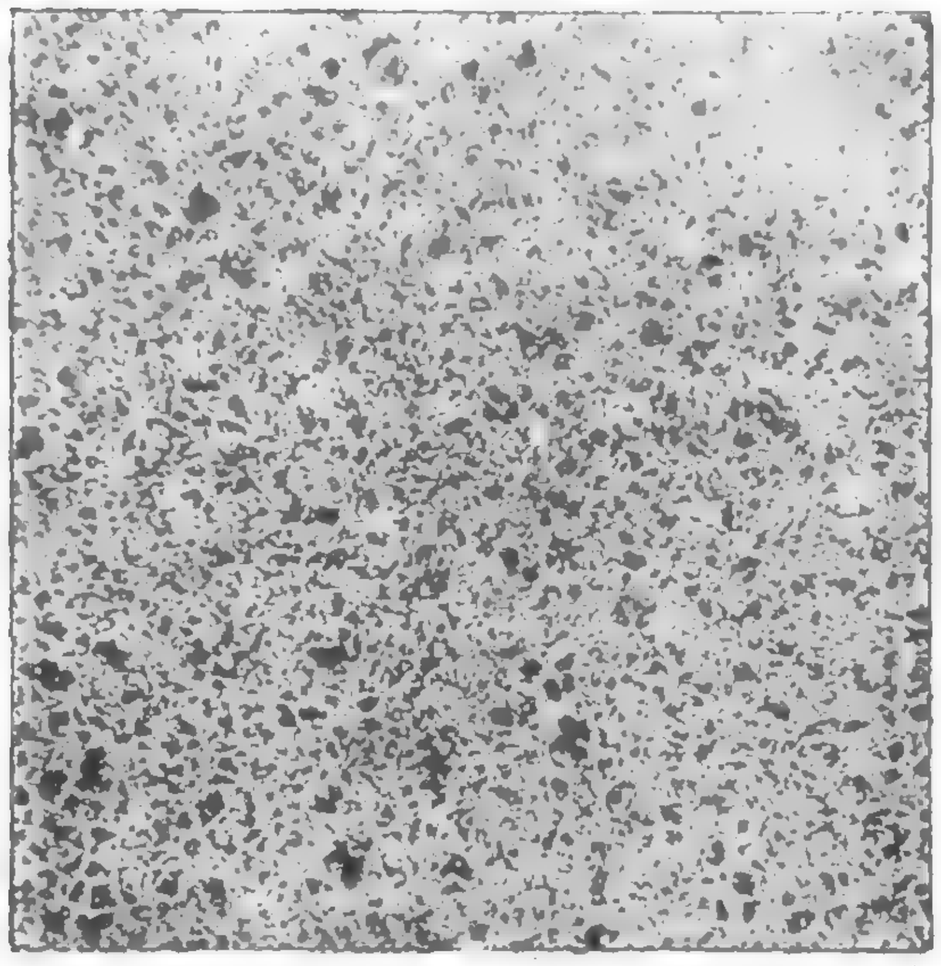


Fig. 7

Where the conchoidal hollows intersect, the ridges appear bright green in colour and rounded. There can be little doubt that this is due to the action of surface tension forces upon the profoundly disturbed molecules along the lines of intersection. These surface flow

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

ridges are really the initial stages of the polishing action to be described later.

Until comparatively recently, I personally, had great difficulty in understanding how the glass in the operation of grinding escaped being fractured in other than a conchoidal fashion. It is, indeed, remarkable that in the rough grinding process practically none of the multitude of surface fractures penetrates the glass without being deflected outwards to the surface.

If a polished surface is covered with an abrasive and the tool is lowered sharply upon it, a microscopic examination will reveal numerous cone fractures penetrating deeply into the substance. Any attempt to work out these fractures will only cause them to extend farther. Abrasion evidently is not due to a direct pounding action. Indeed such a pounding action must inevitably spoil the work.

For the purpose of investigating the action, I prepared a number of polished cubes of glass which could be observed transversely while being operated upon and when mounted upon a polariscope. By means of polarised light it is possible to observe the strains introduced by pressure. The results are represented in fig. 8.

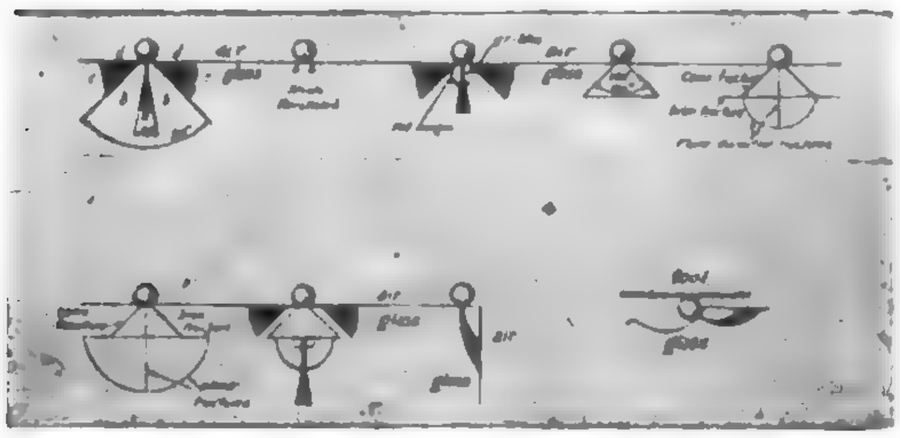


Fig. 8

When a steel ball was pressed vertically upon the polished surface and the polarising Nicols were crossed so that the strain introduced could be viewed, the appearance was as indicated in the first stage, the white portions being those highly stressed. When the Nicols were paralleled it was evident that the polished surface layer had been ruptured normally. Some of these percussion surface cracks which are very easily produced, are represented in fig. 9, and fig. 10 shows several series of percussion cracks produced by drawing over the surface a loaded gramophone needle.

Reverting to fig. 8, further pressure produces a coloured sphere immediately under the steel ball. This sphere is a certain indication of the production of the cone fracture represented in the fourth stage. When the load on the ball is again increased the surface wedging action causes the cone fracture to extend horizontally like the brim of a hat, and at the same time vertical diametral plane fractures are produced. These fractures can be extended to the edge of the brim as indicated in the sixth stage. Usually at this point the glass under the ball collapses almost explosively, the concavity being lined with a snow like powder. Under crossed Nicols the appearance is as indicated in the seventh stage.

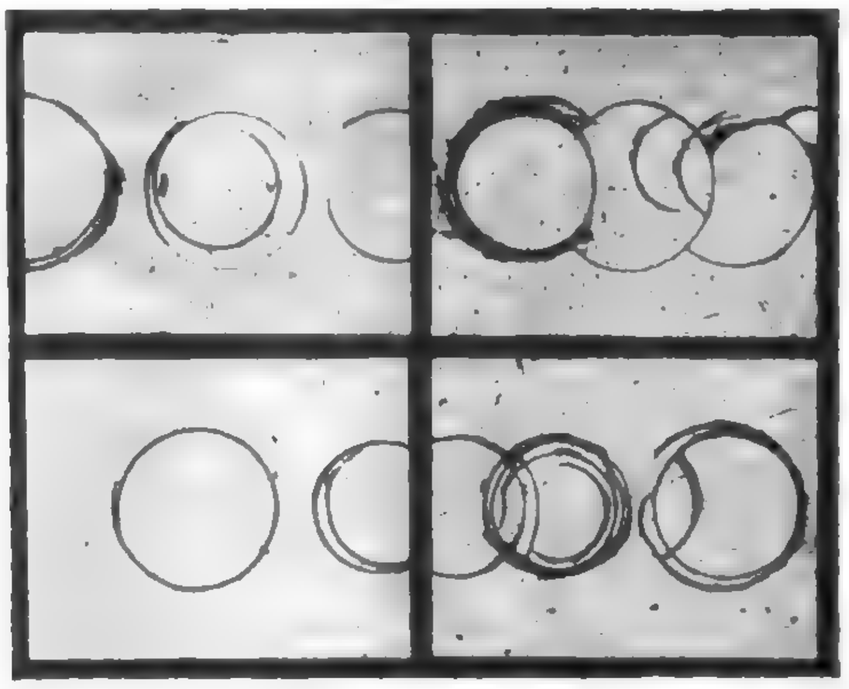


Fig. 9

Now in the abrasion of glass there is no evidence whatever of the formation of cone fractures and it is necessary to look further for a true explanation of the action.

In the experiments so far described the pressure was applied near the centre of the block where the horizontal forces were balanced. A new series was, therefore, carried out near the margin of the face with the result indicated in the eighth stage. It will be seen that the strain is no longer symmetrical about the axis of the pressure but that it is deviated towards the free side. Increase of pressure results in a true conchoidal splinter being formed without the previous production of any cone fracture.

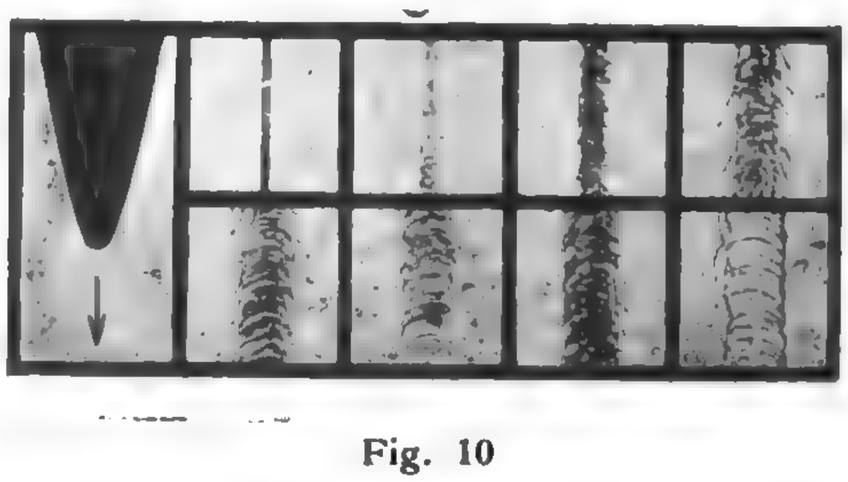
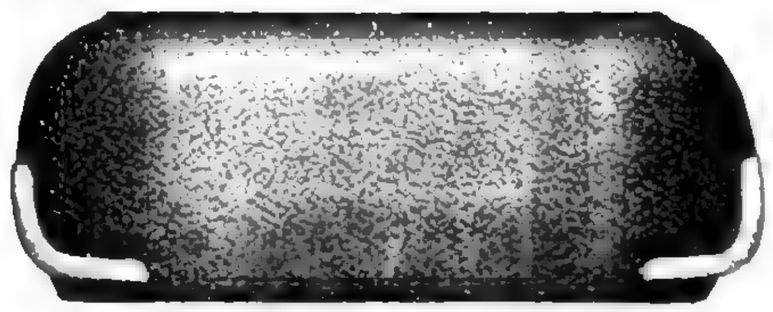


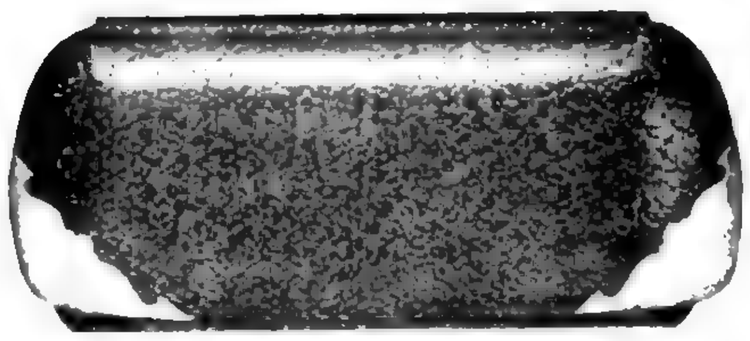
Fig. 10

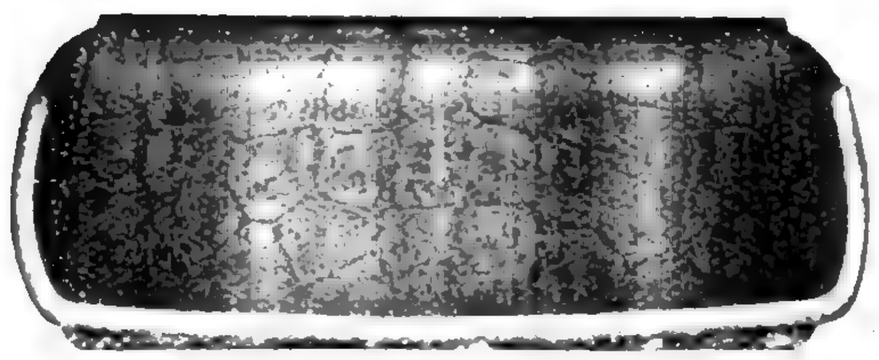
The action of an abrasive can now be more clearly understood from an examination of the last stage which shows a grain being wedged

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Silver Mounted Cases.







These Silver Mounted Cases are beautifully finished in high-class leathers of various grains and dainty shades.

Particulars and samples direct from the manufacturers.

WILLMOTTS LIMITED,

EVESHAM, Willmotts Ltd **WORCESTERSHIRE,**

ENGLAND.

C

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

2 B

QUITE CANDID WITH YOU WE ARE NOT CLAIMING TO BE

THE **CHEAPEST,** BUT THE **BEST** AND **QUICKEST** FOR **RX WORK.**

IF YOUR CUSTOMERS ARE OF THE EXACTING

OR NOT TO BE

DISAPPOINTED VARIETY, LET US HELP YOU TO FULFIL YOUR PROMISES.

ARE YOU GOING TO GIVE US A TRIAL AND BE THOROUGHLY SATISFIED?

THAT IS THE QUESTION.

Telephone: HOLBORN 1828 (Private Exchange).

KIRK BROTHERS

WHOLESALE & MANUFACTURING OPTICIANS

Telegrams: KIRBROREX, HOLB. LONDON.

36, GRAY'S INN ROAD, LONDON, W.C.1

Price List and Prescription Book on Application.

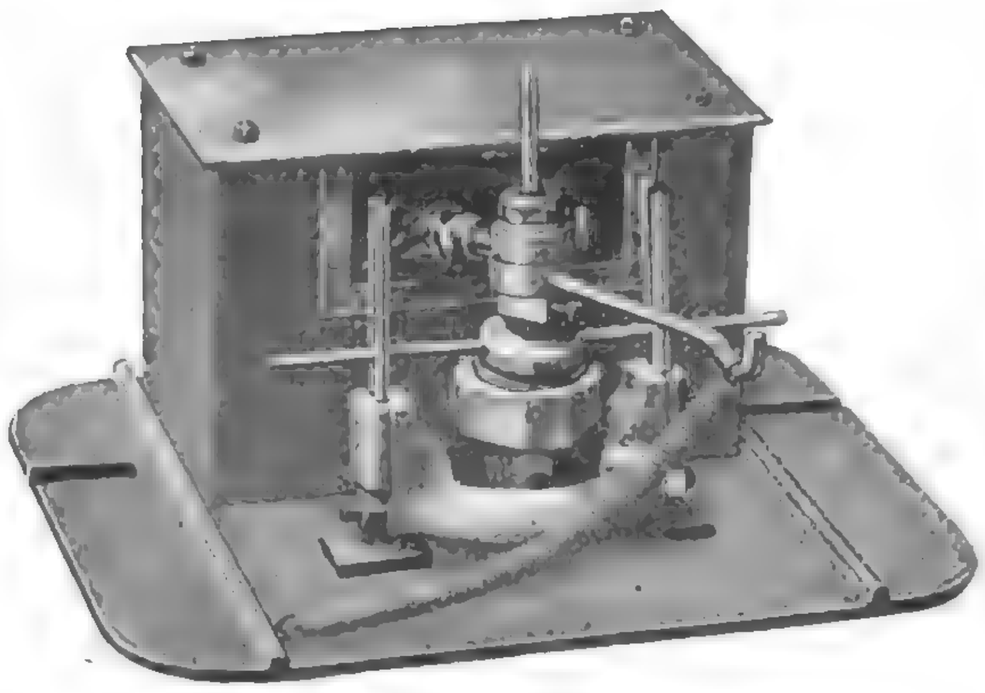
"SOMCO"

AUTO-SURFACING MACHINE.

PATENTED IN
GREAT BRITAIN
U.S.A.
FRANCE
GERMANY.

LONDON
MADE.

Ask for Quotations.



Requires Only 1/6 H.P.

TOOLS
GAUGES
SURFACING
SHOP
EQUIPMENT
OPTICAL
MACHINERY & INSTRUMENT
REPAIRS.

SURGICAL & OPTICAL MFG., Co.,
22, Union Road,
Clapham, London, S.W.4

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

against the side of a conchoidal cavity by the forward movement of the grinding tool. Several conclusions can at once be formed. Transverse motion of the grinding tool is essential in order to wedge the grains against the glass and thus to transmit the forces that produce the splinters. A vertical pounding

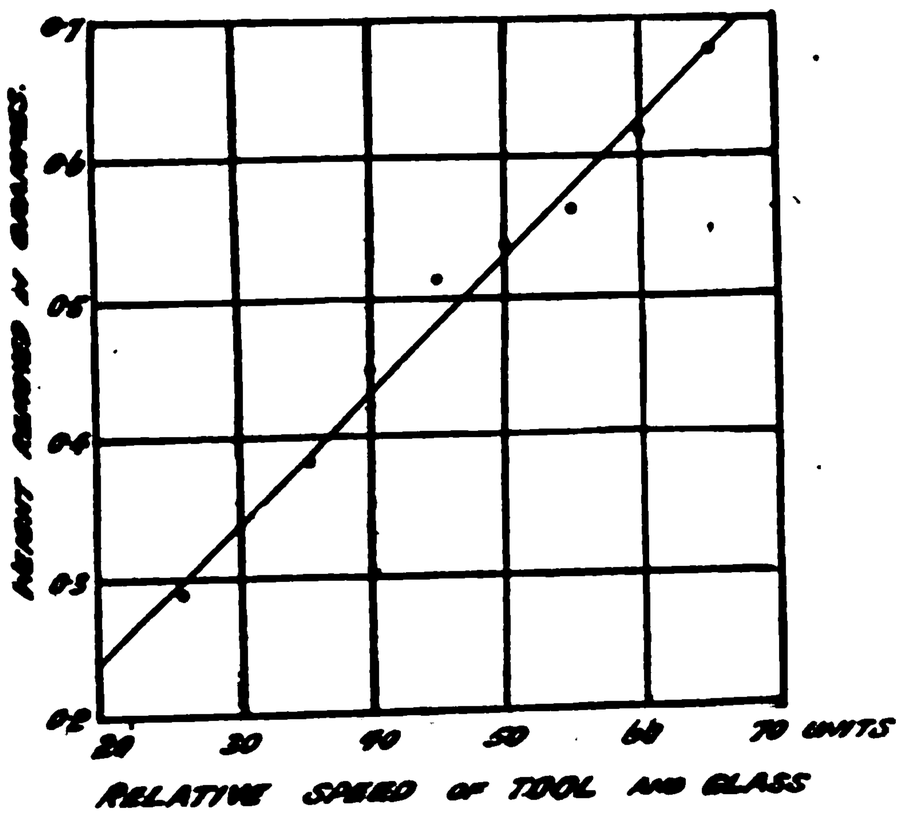


Fig. 11

action plays no part in the process. The faster the movement of the tool, the greater should be the rate of abrasion since each grain will be brought into action more frequently. The greater the impact pressure, the more deeply will the lines of force penetrate into the material and the larger will be the size of the splinters.

Thus the rate of abrasion depends upon the load on the tool and upon its inertia, and to a very considerable extent upon the grip of the tool upon the abrasive grains. Cast iron, for example, is more effective than hard steel.

There is another most important factor the effect of which can be predicted from the illustration, namely the size of the grain. A small grain will only become wedged at the extreme edge of the cavity and produce a minute splinter, while a larger grain will strike more deeply and produce a larger fragment. Experiments carefully regulated to ensure constant conditions confirm these conclusions. Fig. 11, for example, shows how the removal of material is affected by the speed of the grinding tool relatively to the glass. Speeds are plotted horizontally and the grammes of material removed are plotted vertically. The abrasion is evidently proportional to the speed. Doubling the speed doubles the rate of abrasion, but it will be understood that in practice the speed of movement of a heavy tool is limited by the strength of the machine, particularly in the case of a reciprocating tool where the motion has to be reversed at the end of each stroke. Unless the machine is specially designed and in good condition a very high speed may cause chattering and in consequence vertical impacts that may give rise to objectionable cone fractures.

During the summer I had an opportunity of inspecting the principal optical workshops of Germany, and it was interesting to note that there has been no increase of speeds and loads over those customary in that country before the war, or commonly used in Britain. The German practice is, indeed, very similar to the British. Fig. 12 shows the relationship between the load and the rate of abrasion, loads being plotted horizontally and rates in grammes per minute vertically. For the three substances indicated, namely, carborundum, three minute emery and sand, the rate of abrasion is directly proportional to the load. Thus by doubling the load the rate of abrasion is doubled.

As in the case of speed there is a practical limit to the permissible load, which may be obtained by weighting the tool or by the action of a spring. When the motion is a reciprocating one and the speed is high, the inertia

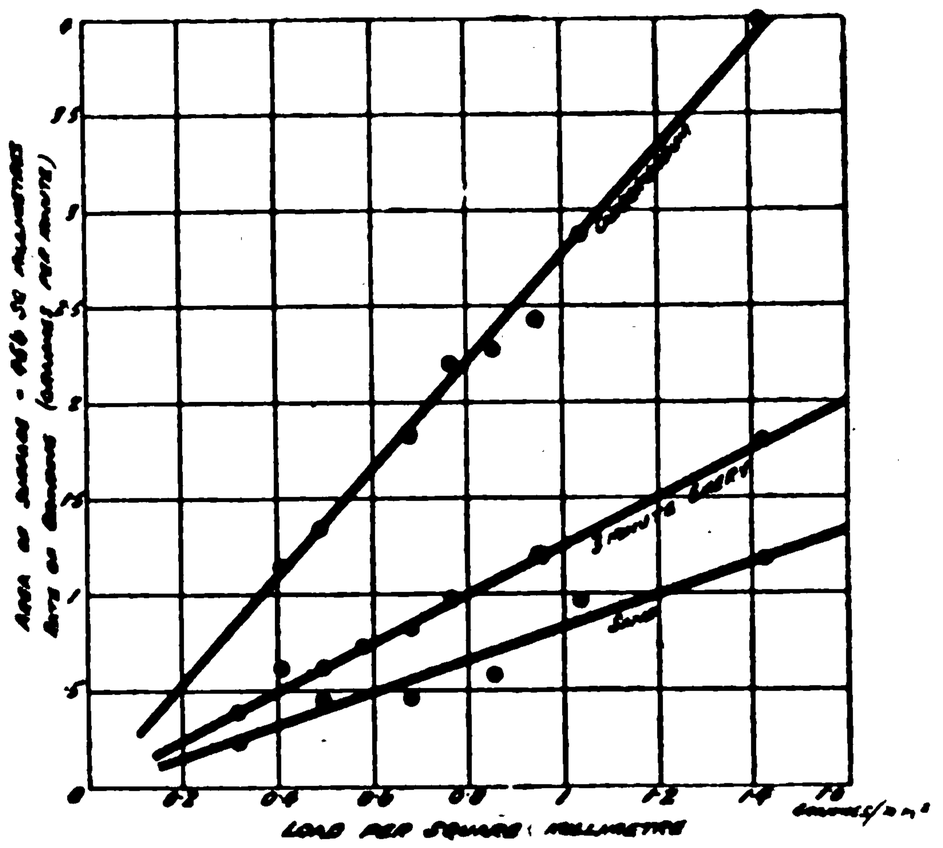


Fig. 12

of a weight is very objectionable at each reversal of the stroke and spring pressure is usually employed.

Results such as those indicated by these experiments can only be obtained by a careful regulation of the conditions. For example, it is essential to renew the abrasive continuously and to feed it at a very regular rate, otherwise there will be a loss of cutting action

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

that will appreciably reduce the rate of abrasion. This is indicated in fig. 13.

Carborundum abrasive having a grain diameter of about one-tenth millimeter was used throughout these particular tests. When fresh abrasive was applied every half minute

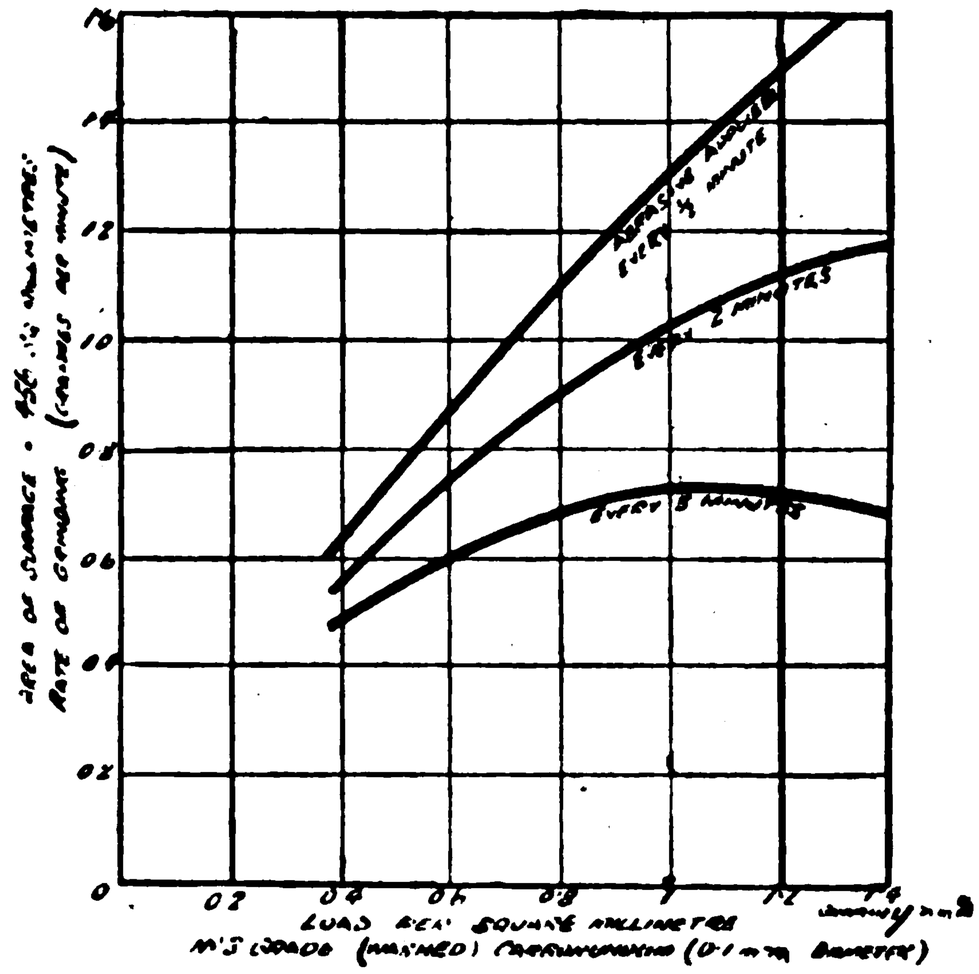


Fig. 13

the rate of grinding was nearly proportional to the load on the tool. When the abrasive was renewed at two minutes interval there was a distinct falling off in the rate of abrasion at the higher loads, and this is very marked when the abrasive was renewed at five minute in-

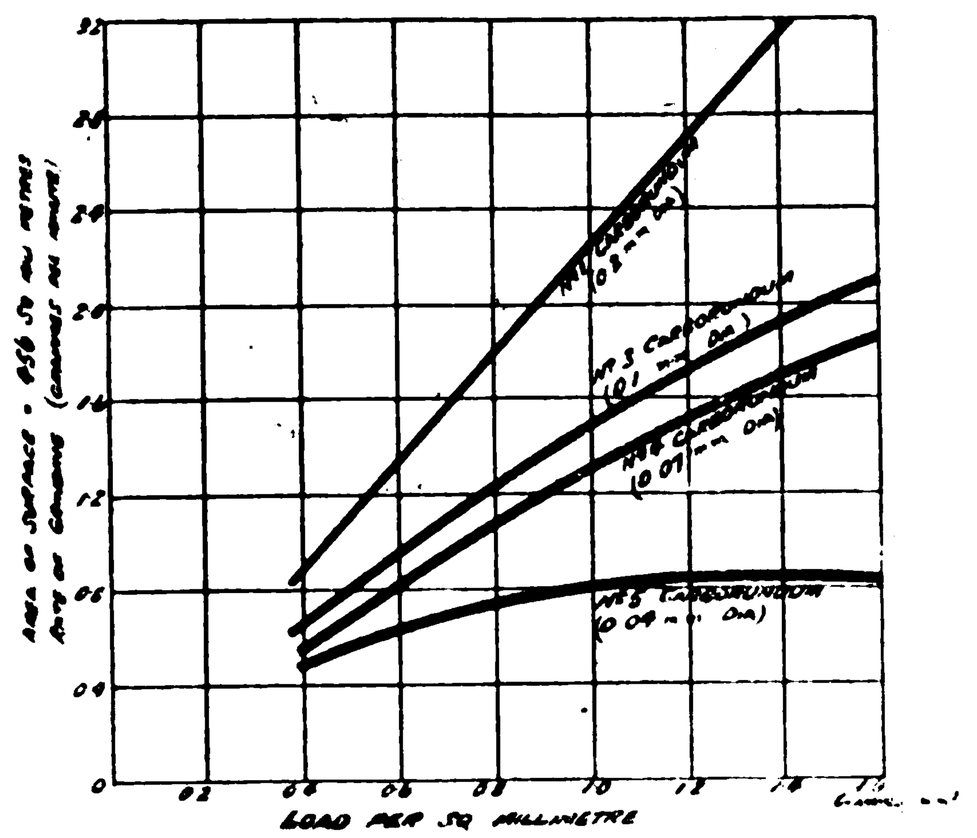


Fig. 14

tervals. Indeed, the rate of abrasion actually diminished owing to the breaking down of the abrasive and the clogging action when the load was greater than 1 gramme per square mm.

The advantage of a continuous automatic supply of abrasive is obvious, but the use of automatic feeds necessitates the installation of washing and grading plant, which is not often available.

That the size of the abrasive grains has an important effect upon the rate of removal of material is evident from fig. 14, which represents the results obtained when using four grades of carborundum. In all the tests fresh abrasive was applied at intervals of three minutes.

Number 1 carborundum has grains of an average diameter of 0.2 mm. and under the conditions of the experiment the rate of abrasion increased directly as the load. When using the finer grades, Nos. 3 and 4, there is a decided loss of cut at the higher loads. A straighter curve would, however, have been obtained by a more frequent application of the abrasive.

The loss of cut is very marked, indeed, in the case of the very fine No. 5 carborundum whose grains have an average diameter of about 1-20th mm. Continuous feeding is es-

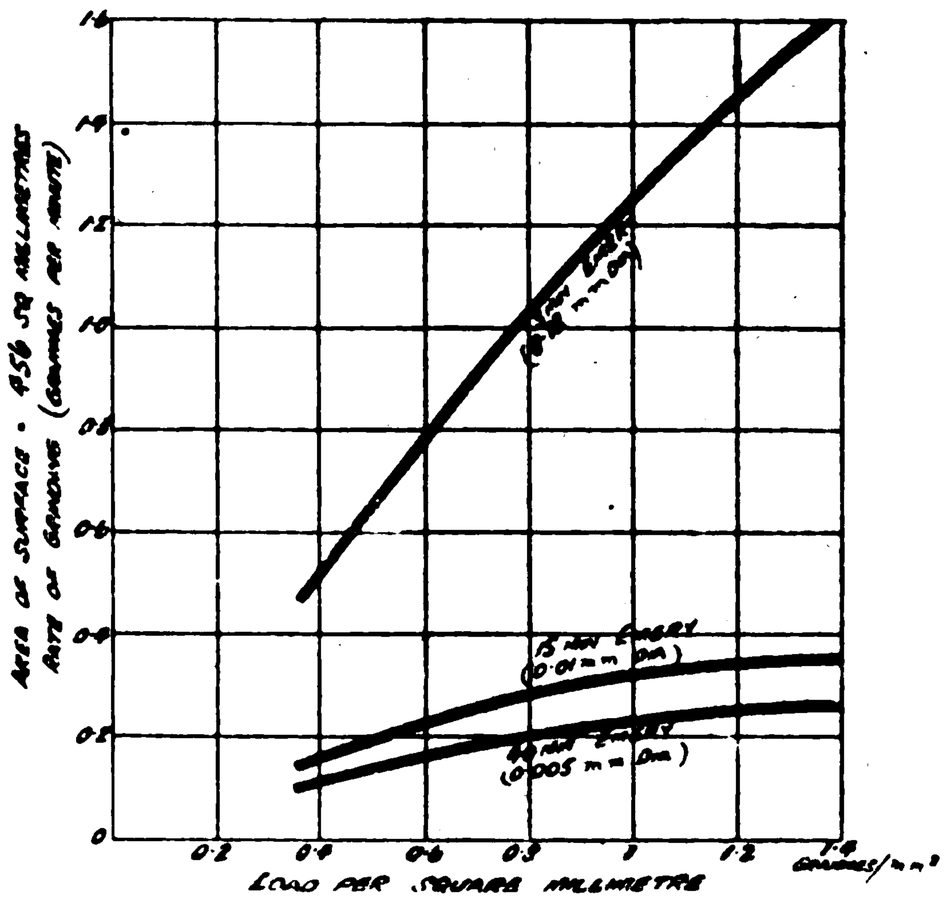


Fig. 15

sential for these fine abrasives if the full advantage of the load is desired.

Similar results obtained under the same conditions but using emery are indicated in fig. 15. In the case of the coarsest 3-minute emery, the curve is very nearly straight, the rate of abrasion being practically proportional to the load, but in the much finer 15-minute and 10-minute grades it is again evident that there is little advantage to be obtained from an increase of the load unless fresh abrasive is very frequently or continuously applied.

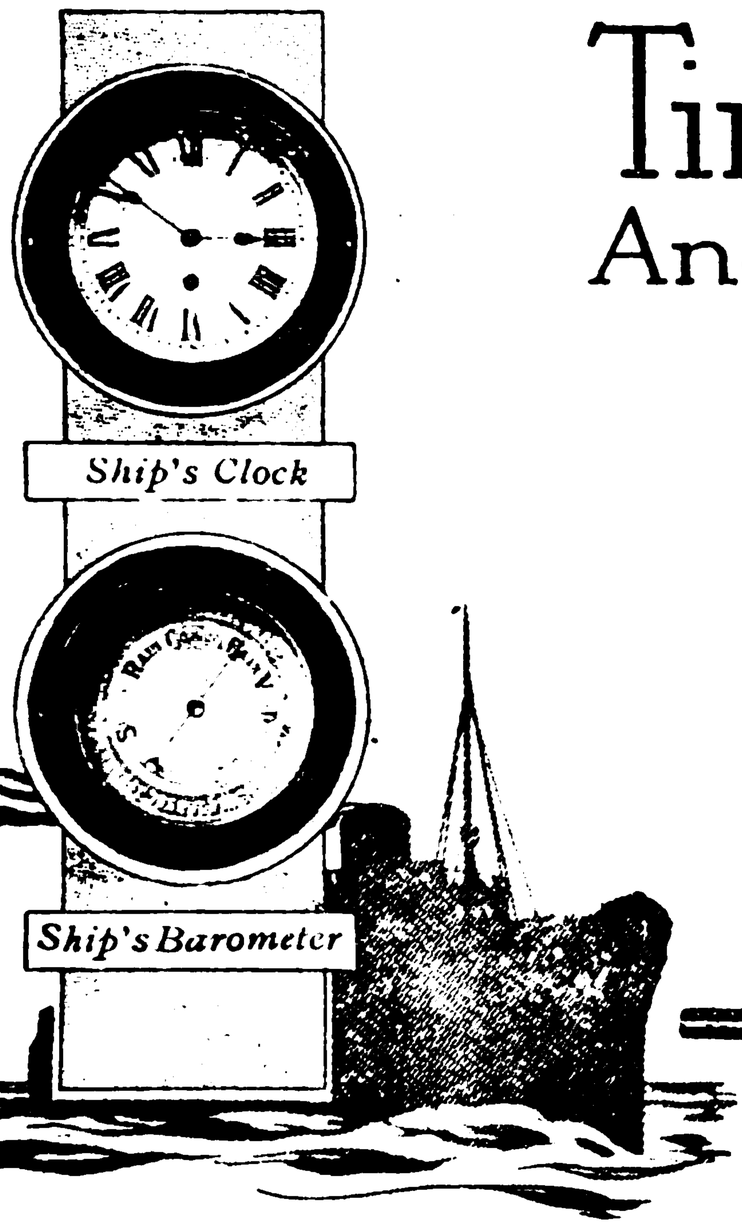
Compared with the 15-minute emery, the 3-minute emery is very coarse, the grains being

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

T. A. R. & Co.

"THE ALL BRITISH HOUSE."

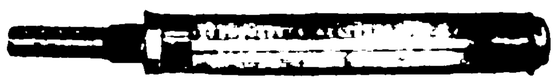
Over 2,000 Designs in Aneroid Barometers.



Time and Tide
And Ship's Instruments



T. A. REYNOLDS & Co
40-1-2 PERCIVAL STREET,
LONDON E.C.1



Steam-pipe Thermometer



Hydrometer

Telegrams—
"THERBAROME. LONDON."

Telephone—
339 CITY.

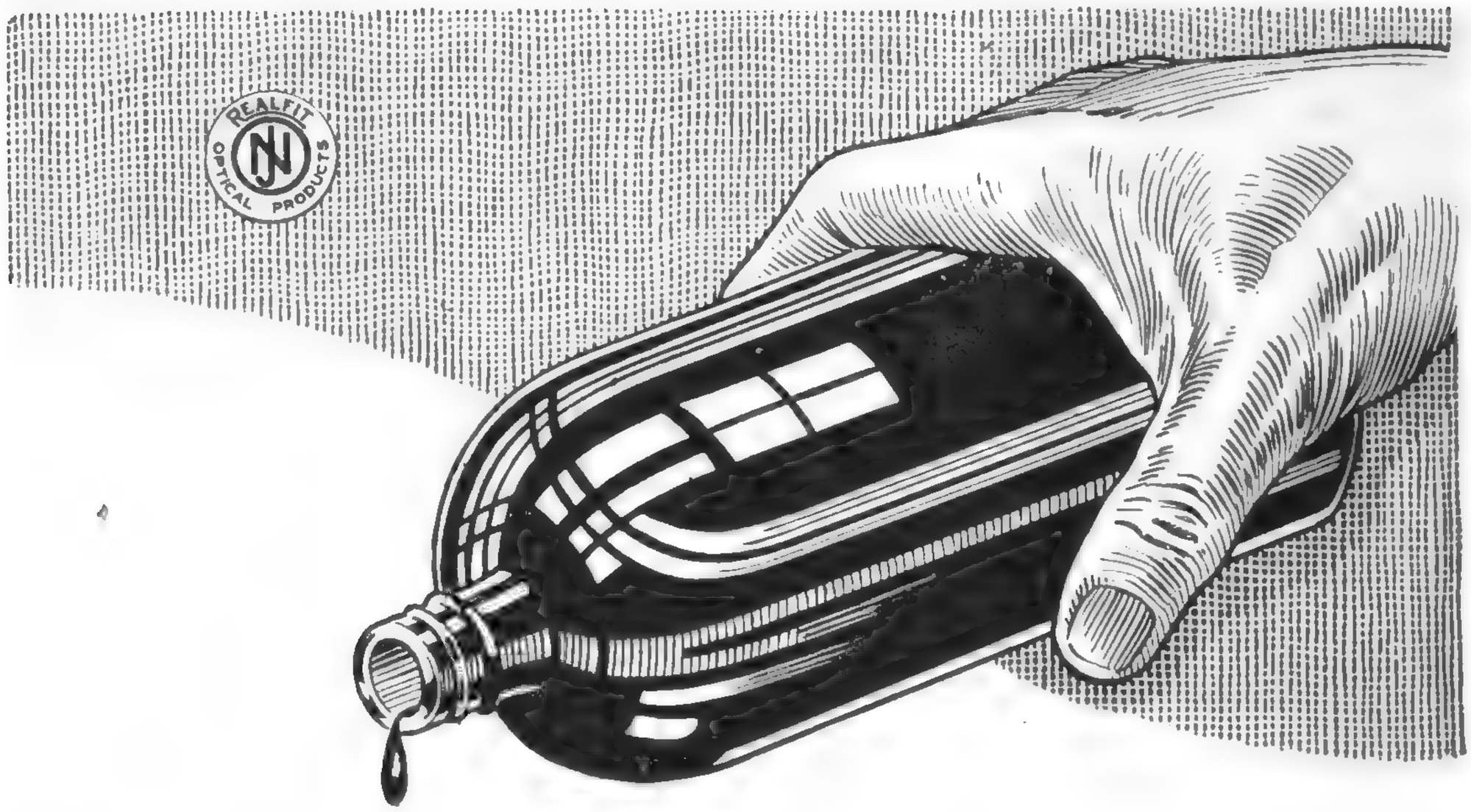
Showrooms and Offices at above address.

If you are a Retailer and need ORIGINAL LINES in Barometers, Clocks and Thermometers, write us, and although we will not supply you direct, we will put you in touch with the Nearest Wholesale House.

WHOLESALE AND SHIPPING TRADE ONLY.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

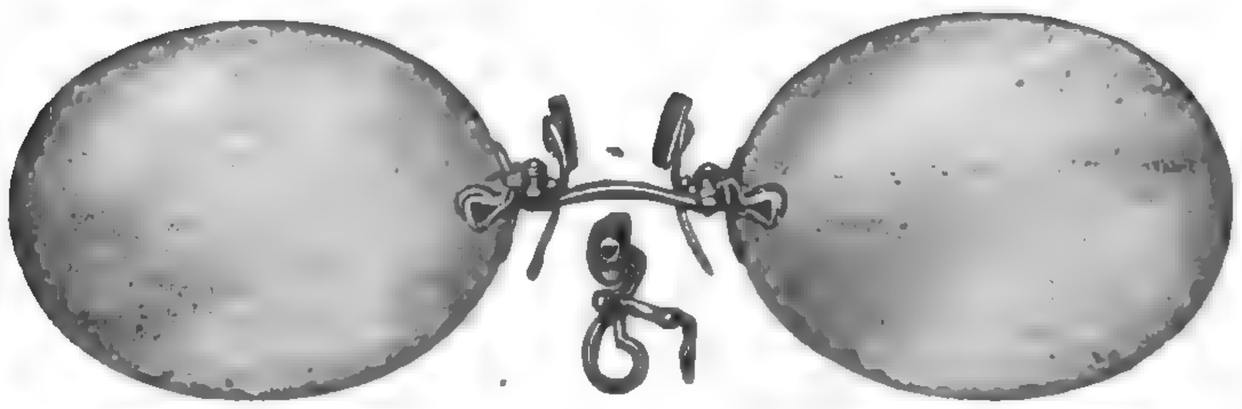




REALFIT

Finger Piece

Mountings and Frames.



The hand of Time applies the acid test to merchandise and men. Many are found wanting; they fall by the wayside. A few possess that element which men call QUALITY. Time cannot efface their greatness.

REALFIT Finger Piece Frames and Mountings are Quality products. Whether you buy to-day or next month, *always* you can be certain of their uniform high standard—of their comfort, beauty and enduring strength.

The best material is used throughout. Every part of the mounting is constructed with great precision.

No less than five inspections testify to the care exercised that no REALFIT should leave our factory unless it is absolutely perfect.

Made in all standard sizes with a complete assortment of Guards. If your Wholesaler cannot supply you, write us.

NEW JERSEY OPTICAL Co.,
Newark, N.J. . . . . U.S.A.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

about 13 times as large. On the other hand, the grains of 15-minute emery are only twice as large as those of the 40-minute emery. These differences in the grain diameters account for the large separation of the 3-minute and 15-minute curves and the relatively small distance between the 15 and 40-minute curves.

[To be continued.]

ENVIRONMENT and VISION.

By H. G. CRITCHLEY, M.A., M.D.

For many years it had been casually remarked that the vision and visual acuity of townfolk are inferior to that of country dwellers, but no reliable statistics or data appear to have been available until the year 1902, when the School Board for London determined to make an extensive enquiry into the condition of school children's eyesight and its relationship to environment and nutritional conditions, and indeed no other corporation was in possession of such an extensive field for investigation or experiment.

During the Boer War, the British forces suffered enormous losses by reason of the superior, the vastly superior, marksmanship of the enemy; this superiority was due to the better quality of vision, and this was due to the fact that while the enemy was for the most part recruited from the veldt and the villages, the British forces, even some of the Highland regiments, comprised a vast, even a preponderating, number of men recruited from cities and densely populated industrial areas.

Those who have in their hands the administration of the Children's Country Holiday Fund and many Teachers in the London Elementary schools repeatedly testify that the vision of children whose habitat is the densely populated areas of the metropolis and environed by high walls, is very appreciably improved by the short period they enjoy of unlimited range of vision over sea and country, and that some children, who at the commencement of their country sojourn, can at a distance of five hundred yards hardly distinguish a cow from a sheep, are able at the end of their holiday readily to distinguish a cow from a horse.

During the period that the London School Board was making the enquiry referred to, I was requested to examine the vision of 50,000 children, ten thousand of each of five different classes or groups living under five different conditions of environment and nutrition. The following table records the variation in the quality of eyesight of the different groups or classes, the figures denoting percentages of defective vision, the subject using both eyes together. Vision and acuity of vision are far worse among the East End Russian Jews than among the poorest class of Gentiles; various theories and explanations have been put forward to account for this, but so far none have been accepted.

I. 37.16 per cent. Jewish children, mostly of Russian nationality residing in the East End.

II. 29.04 per cent. Children of poorer working class parents, living in crowded neighbourhoods where there are no wide main thoroughfares close at hand.

III. 27 per cent. Same class as II, but not so much walled in and where there are wide thoroughfares available for play, etc.

IV. 19.01 per cent. Children living in more or less semi-suburban localities.

V. 18 per cent. Children residing in more outlying suburbs, and children attending the Higher Grade Schools.

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full.

The Proposed Optical "Panel."

Sir,—Will you kindly print in the next issue of *The Optician*, the appended "open letter" to the Secretaries of the National Insurance Beneficent Society.

Open letter to the Secretaries of the National Insurance Beneficent Society.

12a, Lower Hillgate, Stockport.

December 9th, 1921.

"GLASSES FOR INSURED PERSONS.

"Gentlemen,—I should like to reply openly to your circular of 30th November, addressed to the Opticians of the United Kingdom; and to facilitate reference, I have numbered the paragraphs thereof 1 to 25.

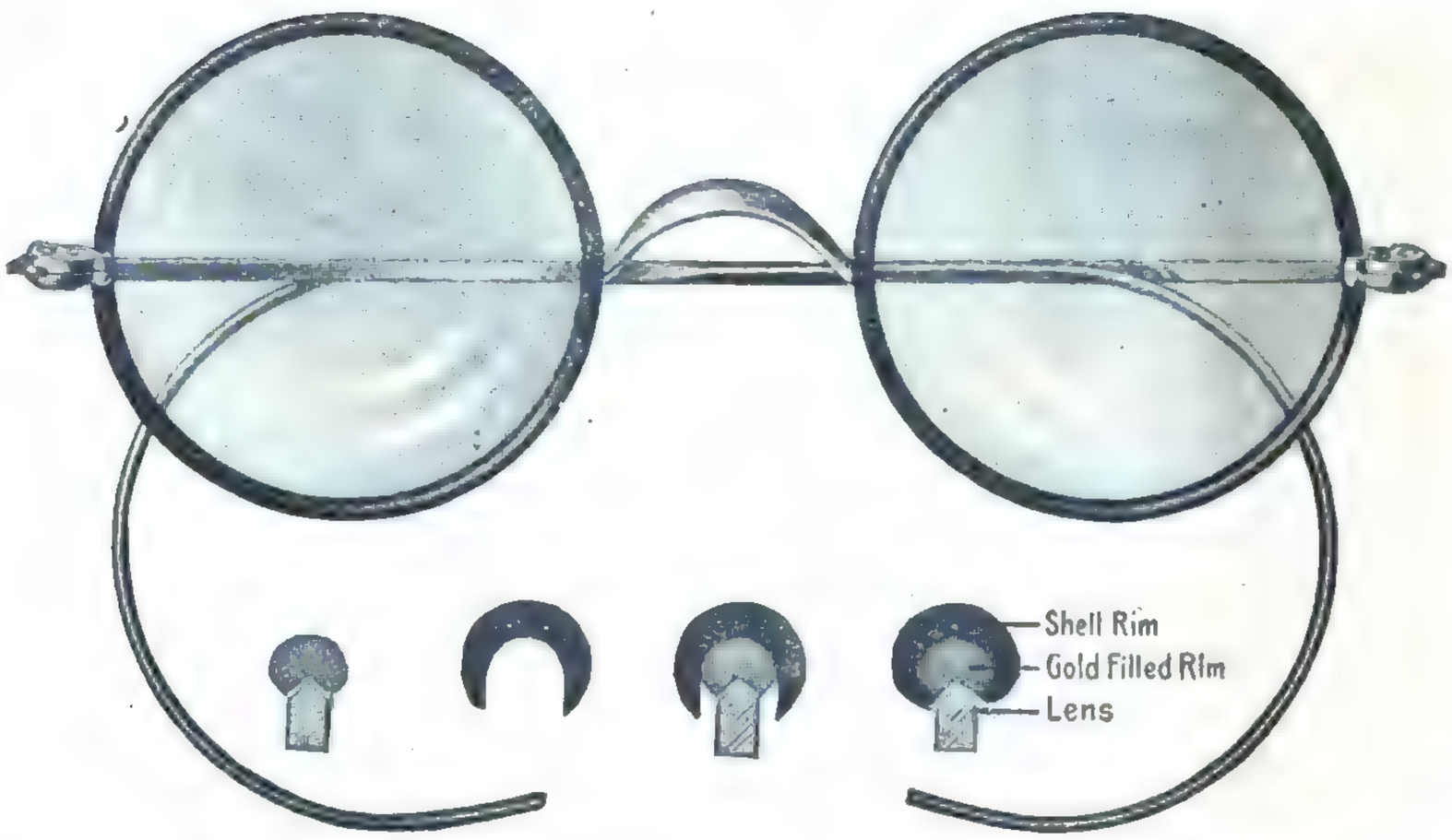
Pars 1 and 2.—The fact that you made your offer on 1st July, and that over five months later it still requires accepting by the majority of the profession, and that you are resorting to threats in your endeavour to get the thing in working order, does not, on the face of it,

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

DUPAUL, YOUNG OPTICAL CO.,

SOUTHBRIDGE, MASS., U.S.A.

The "ONLIWON" GOLD FILLED INNER RIM ZYLO FRAME.



WE claim we have the ONLY ONE of this class of frame that is scientifically and mechanically perfect in construction.

The most important feature of the "ONLIWON" FRAME is, the way the outer Zylo rim is drawn and closed over the gold filled inner metal rim by a mechanical process known as "crimping," which means curling, turning, drawing, pressing, squeezing. Burnishing one over the other by heat and pressure, thus firmly clamping it securely to the now imbedded inner metal rim, without screws, rivets or clamps

"ONLIWON" Frames can be formed to any desired shape of eye without the two rims separating.

"ONLIWON" Frames have thin, inconspicuous rims and are not clumsy or showy.

All our Bridges have a Rounded Base at Shank.

Which absolutely prevents the Breaking or cracking of the gold shell of the filled metal during the process of shaping them to size, which is distinctly a Dupaul, Young Optical Company feature on all our frames.

The special KANTFEEL TEMPLES used on "ONLIWON" FRAMES are so made as to almost totally eliminate their breaking at the end-piece.

To be obtained from all Wholesale Optical Houses.

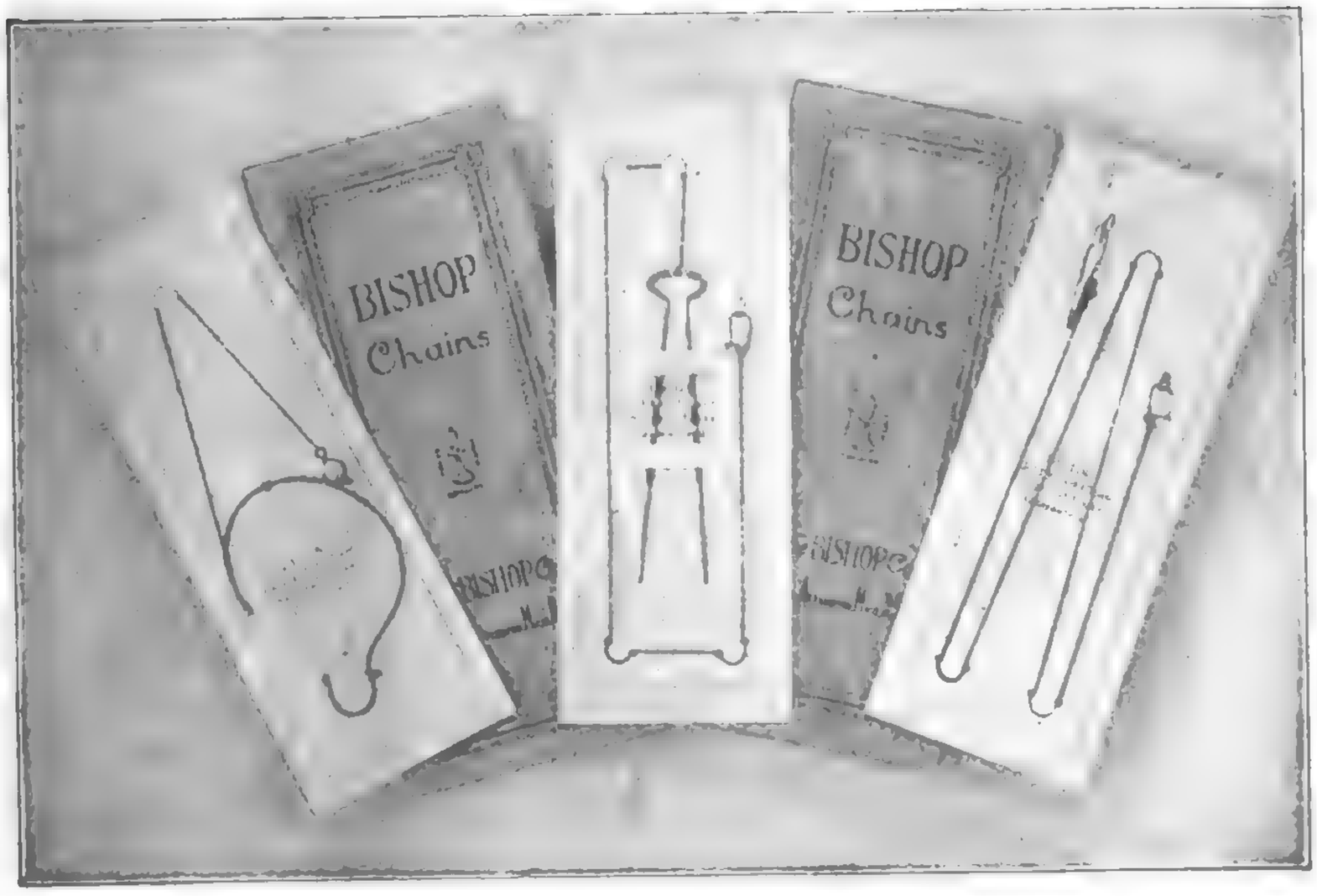
LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE BISHOP CO., INC.,
NORTH ATTLEBORO, MASS., U.S.A.



EYEGLASS CHAINS
In Gold and Gold Filled

GUARANTEED QUALITY, BEST WORKMANSHIP,
PERFECT COLOUR, SOLDERED LINKS.

ALSO

SILK EYEGLASS & MONOCLE RIBBONS

With Gold Filled snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

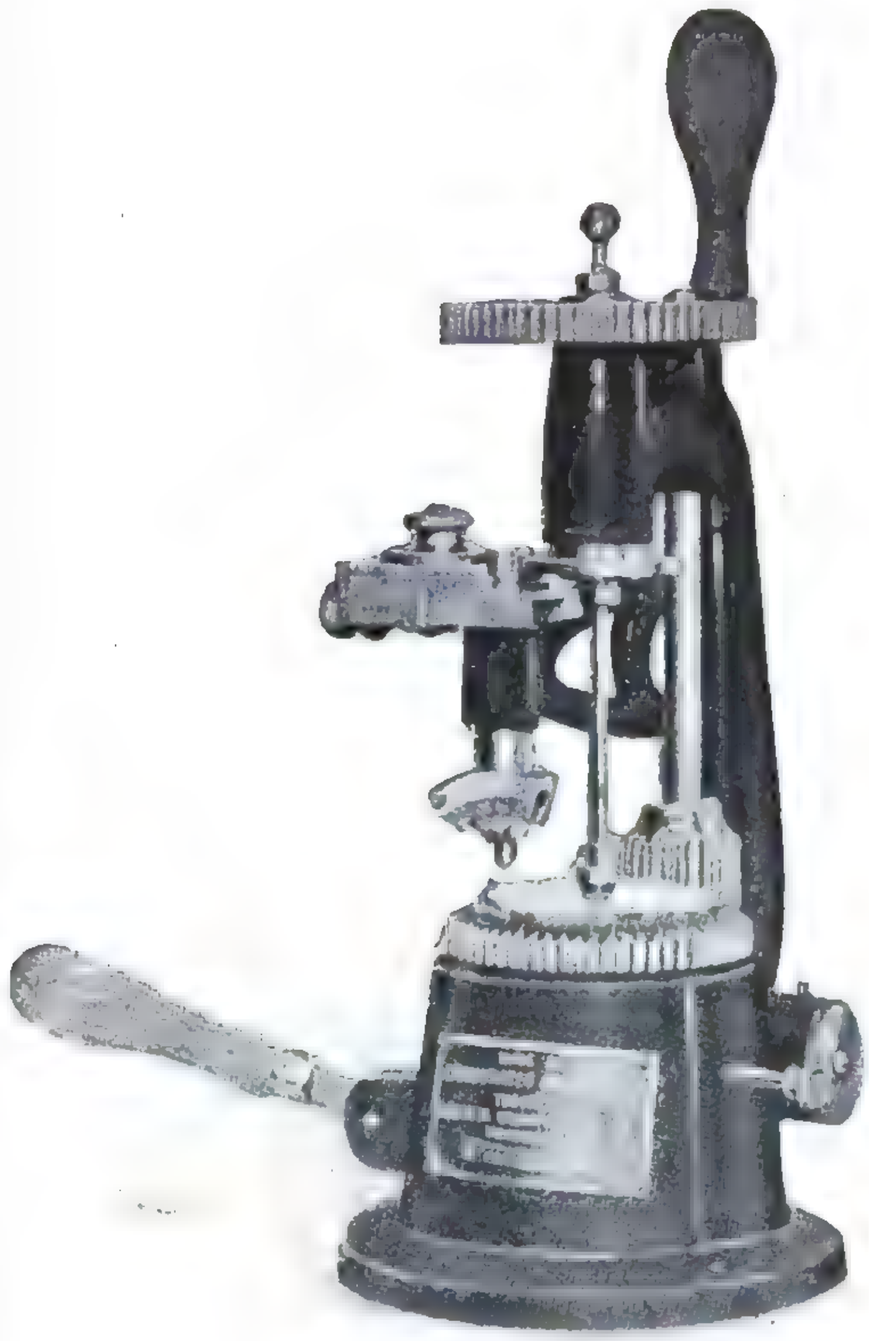
Made in a large variety of styles and widths of fine grade silk.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google Original from THE OHIO STATE UNIVERSITY



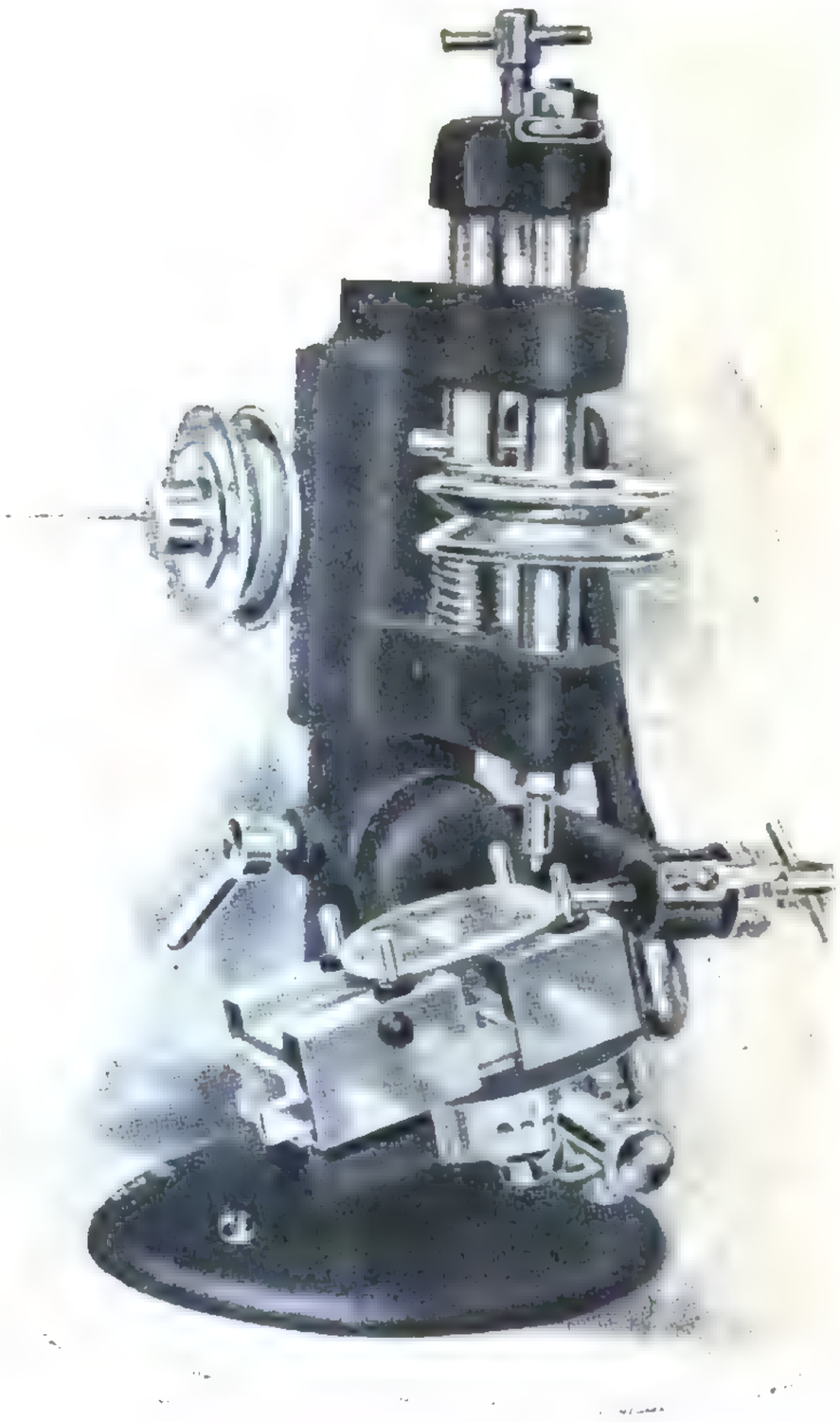
The
"Consol" Lens Cutter.

There are "Lens Cutters" and there is the "Consol" Lens Cutter and that's the difference.

The "Consol" has been built by Mechanics who know their work, and who have more than a fleeting knowledge of what a Lens Cutter has to do.

In consequence they have evolved a machine which for efficiency, simplicity, accuracy and strength, cannot be surpassed.

The tilting attachment supplied on a "Consol" Cutter is readily set to cut any lens, being made so that it permits setting at a perpendicular to the curve of Lens.



The
"Consol" Lens Drill.

The modern large Prescription Plants can only carry on by using the finest machines, and this "Consol" Drill is found in every up-to-date works. One testimonial says—"Your 'Consol' Lens Drill is a beauty, and the more I use it, the better I like it."

The "CONSOL" MACHINERY includes SENIOR and JUNIOR AUTOMATIC LENS EDGING MACHINES, COMPLETE OPTICAL WORK BENCHES, DRILLS, CUTTERS, SURFACERS and particulars of any class of our machines can be obtained from ANY WHOLESALE OPTICAL HOUSE, or from

THE GENERAL OPTICAL Co., (E. T. & F. W. Cornwell),
32, ELY PLACE, HOLBORN, LONDON, E.C.1

Who are the sole distributors of "CONSOL" Machinery Products.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

speak very highly for the terms of the offer.

The amended offer does not differ very materially from the first one, which allowed practically nothing for testing and an extremely small profit on sale of goods provided the cheapest possible material be used. The second or amended offer allowed a small fee for testing, and no profit on sale of goods. Both offers are absolutely and equally ridiculous.

Let us see what your offer really means. Stripped of all superfluities, your proposition is that we shall, on a portion, say one-half to two- thirds of our *existing* business, forego all profit and test for next to nothing. You cannot increase the amount of optical business to be done, and as a matter of fact, you do not claim that any advantage is likely to accrue to the optician. The only difference would be that a portion of the optician's business instead of coming to him direct, would be diverted through your Society; and at a price which would show him a loss, having regard to his general business liabilities.

Inferior Service.

If the business were undertaken on these terms, the door would be opened to underhand methods and inferior service; and it would be a great mistake, and unfair to insured persons, to make the charges so low as to jeopardise the quality of the services to be rendered or the appliances to be supplied. Personally, gentlemen, I should not like to see Optical Benefits develop along the same lines as Medical Benefits, which many self-respecting Insured Persons will have nothing to do with, preferring rather to pay again and be treated as a private patient; and I promise you that I shall do all in my power to prevent National Health Insurance 'Optical Benefits' being given the taint of charity.

Pars. 3 and 4.—It is quite true that the optician gets large profits, and he will get larger profits still as he improves the service he renders the public. The average oculist gets two or three guineas for each test. The average present day sight-testing optician's services are worth a guinea plus profits on sales; and they will be worth more before your next quinquennial valuation.

I am sorry for the two hundred opticians who accepted your original terms. I did not think you would have found so many who would have valued their sight-testing at a few coppers; however, I suppose it is still possible to find some opticians who would do it for nothing. But even secretaries of Insurance Societies get paid for their services, and so ought opticians.

With regard to the "first class service at even lower rates" you say you have had offered—I do not doubt this. The philanthropic optician is still abroad; but somehow or other, he manages to make a fortune out of his disinterested efforts on behalf of poor suffering amblyopes and emmetropes. The ordinary qualified optician, however, intends to deal straightforwardly and be fair to his patients, his competitors, and to himself; and although he of necessity works on high profits, he gives good value, is straight, and has a good record; which cannot be said of all those engaged in the sight-testing profession.

Pars. 5 and 6.—I am sorry to see the National Association of Opticians valuing the services of their members at five shillings per test, and no profits on sales. I do not, for a moment, wish to say anything against this body, who do a good work in their way, as they are the only people (or were until quite recently) who take any interest in the organisation of the uncertificated opticians, who compose, I take it, the bulk of their members. Five shillings per test might suit a man who does two or three tests a week, as he obviously gets his living in other ways; but the exclusively sight-testing man, who does say thirty to forty tests a week, and whose business expenses are say £500 to £1,000 per annum, would find it impossible to exist on such remuneration; and this latter is the type of optician who should be taken as the standard.

A Guinea Fee.

I expect to see most of the members of the N.A.O. repudiate these terms—the services of their best men are worth a guinea at least.

Pars. 7 and 9.—These two paragraphs do not mean the same thing. Who ever heard of a business man supplying goods at what they cost? Do you know, gentlemen, that there are many opticians who pay considerably over £1,000 per annum in rent alone for one shop? If the optician consents to do without profits, will your Society pay his rent, rates, and general business expenses? An optician, by valuing his services as low as half a guinea, in reality makes allowance for receiving a profit on the sale of his glasses in addition.

Pars. 8 and 10.—The allegation that it was sought to have this insurance business confined to qualified opticians, reads very strangely coming from you, as it was you yourselves, gentlemen, who first originated

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

the idea of doing this work through a panel of qualified opticians, in your circular of July 1st, par. 4. (See *The Optician*, No. 1583, p. 336.—Ed.)

There are, of course, many good men who are not qualified; but the only safe way would be to have only qualified men on this work. If a really good unqualified man feels himself aggrieved by being passed over, he can remedy matters himself by getting qualified.

Par. 11.—Your threat to tell the public what optical goods cost is childish. Tell them if it pleases you; and also tell them what artificial teeth and doctors' prescriptions cost.

Why a Discount?

Pars. 12 and 13.—Why should your Society have any discount? You talk as if you were providing a clientele for us, whereas those who would come to us through you are *our present patients* who come to us now direct without your aid.

By all means, gentlemen, do as you threaten, and advise all approved Societies to apply their surplus funds to other than optical benefits. It is certainly not to the optician's benefit that he should give up his present method of dealing direct with the public.

Par. 14.—The terms you suggest are not identical with those of the I.O.O. If they are, the I.O.O. gets my resignation.

Par. 19.—Your italics make me smile. I should be sorry; in fact, I should be very foolish, to be guided by you.

To sum up, gentlemen, your terms are ridiculously impossible, and I hope and trust that all those who know themselves to be efficient sight-testing men and women, will make a determined stand against your Society's interference with their livelihood, and have nothing whatever to do with your schemes as at present outlined. Let the Insurance people content themselves with supplying their members with serviceable steel frames complete with the necessary lenses, on something like the B.O.A. and I.O.O. terms, and leave the members to themselves arrange with the optician regarding anything beyond this; and if you do this, I have no doubt, the responsible organisations of opticians will help you to make a success of your undertaking; but please do not get irritable and nasty and issue threats just because you cannot have everything your own way.

"Yours truly,

(Signed) HERBERT SMITH.

"An Open Insult."

Sir,—The letter addressed to the opticians of the United Kingdom by the National Beneficent Society is an open insult to the opticians, as the fees offered are far less than the wages of a mechanic. As we are faced with an Optical Trade Board, one wishes that such a measure could be applied to prevent opticians working at sweated rates. To think that sane men would expect opticians, who have spent years of study in training, to refract correctly, to receive less for their labours than what is paid to mechanics or even dustmen is regrettable, yet that is what the offer amounts to. Besides it is asked to give credit and receive no profit on the money laid out.

Now, suppose that one were to undertake this work, and only devote that time for which he is paid to the job of testing, measuring, checking, delivering and mere clerical work. Result, a misfit in glasses and fitting, as it cannot all be done in the time paid for. What is the unfortunate wearer to do? Go elsewhere and pay for proper attention and goods, or what? The optician who fitted him up could not offer to replace those lenses at the price paid (cost) and so would either repudiate responsibility or liability, or be out of pocket for the cost of alteration.

One would like to know who the N.I.B. Society is, and the 60 Societies it represents, also their total membership. If the N.I.B.S. disclose their knowledge of costs, etc., it would not harm, as the 60 Societies, being made up of workers (not organisers or clerks in offices), would not expect work done for nothing any more than they would work at the sweated rates of pay. I, for one, think it would be better for the trade if the hospitals were approached, as they would not take the work on at the rate offered, as already the "letter" a patient has to take for treatment to a hospital represents a far greater amount of money paid as a subscription by someone.

The opinion expressed in a letter in *The Optician*, of Dec. 2nd, *re* the N.A.O. expecting by doing this work to obtain the much hoped for recognition, is a short-sighted policy; as in consequence of doing this work the optical trade would not pay, and so there would be none to worry about "Acts," otherwise than the Bankruptcy Act. If those who have passed examinations value their services, why not those who have not? In the case of a chemist or jeweller, one could give some-

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Seven Styles

now made in

"OCENTRIC" EYEGLASSES

BRITISH MADE.



A Distinctive Model for Each Individual Taste.

RIMLESS MOUNTS & FRAMES. G.F. & SOLID GOLD.

O series Short Plaquets Regular pattern
100 „ Normal Plaquets Regular Pattern
200 „ Long Plaquets Regular Pattern
300 „ For Centrally Drilled Lenses
(BENT UP PLAQUET ENDS.)
400 „ For Centrally Drilled Lenses
(CLAMPS ATTACHED BY SHORT BRACKET.)
700 „ For Centrally Drilled Lenses
(SWAN NECK BRACKETS.)
800 „ Regular Pattern with Double Straps

SAMPLES and PRICES WILLINGLY ON APPLICATION.

The British Ocentric Optical Co., Ltd.,

Wholesale and Manufacturing Opticians,

12 & 13, EAGLE STREET, SOUTHAMPTON ROW,

LONDON, W.C. 1

Telegrams—Ocentricco, Westcent, London. *'Phone—Holborn 560*

Cables—Ocentricco, London.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

thing away to give a draw to other goods. One would like to know if the doctors have had this work already offered or not. I want a suit and have wondered if my tailor would supply one under similar conditions. Where is this going to end?

JOHN.

A Liverywoman.

Miss Elizabeth Maud Weston, F.S.M.C., has the honour of being the first lady diploma holder of the Worshipful Company of Spectaclemakers to be admitted to the livery of the Guild. Miss Weston is the eldest



daughter of the late Mr. W. H. Weston, of Hinckley; she gained the Company's diploma for sight-testing in 1917. Since her father's decease in 1918, Miss Weston has carried on her late father's business at Hinckley. The late Mr. Weston was himself a diplomate of the Company.

English Books for Latvia.

From the Lord Mayor of London we have a letter pointing out that Latvia, one of the new Baltic States, has decided to make English the first foreign language to be taught in its University and schools. English ideals should therefore, henceforth, take an important place in the educational programme of this new State. But the teaching of English is much hindered by the dearth of good books in our language, and the purchase of these by the Letts is now very difficult owing to the adverse rate of exchange. The want, however, could easily be supplied at little cost to itself by the British public, which has thus a great opportunity to befriend a nation that desires to draw closer its ties with Great Britain. Standard works on our language, disused schoolbooks, as also scientific and other professional works are those most wanted. Gifts of such books which can be spared by their owners should be directed to Sir Alfred T. Davies, C.B., c/o the Consul-General for Latvia, 329, High Holborn, London, W.C.1.

We have received a letter on the subject of "Fees for Sight-Testing" from "Standard"; but its publication over the pseudonym cannot be considered unless the writer sends us his name and address, for our private information.

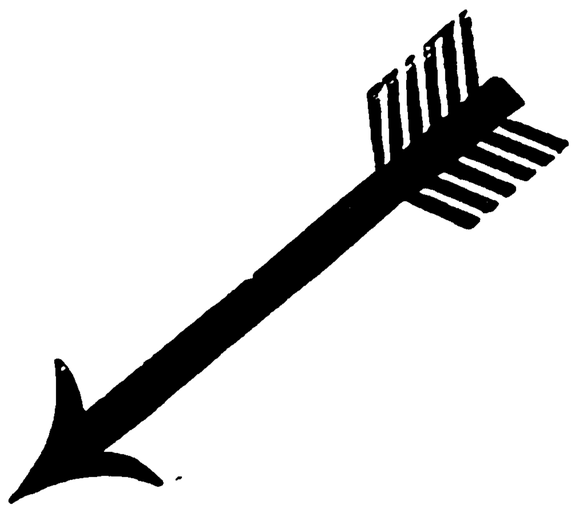
In our advertising columns the Disposal and Liquidation Commission announce for sale a quantity of surplus medical stores, including optical and other scientific apparatus, spectacles, lenses, etc. Offers to purchase items of the scheduled stock have to be made before January 16th next.

Bondwell F.C. (C. W. Dixey & Son) continued their recent good form by defeating Highbury Institute at Lea Bridge Road on Saturday, December 10th, by 5—0. On October 8th, at East Finchley, Highbury won 8—1, so the "Bees" avenged their previous heavy defeat. The Bondwell F.C. display was good in attack and defence, but more steadiness at close quarters would have brought more goals. The home forwards were a superior force to the Highbury attack, but in defence, the visitors showed good form, once they settled down. Highbury were surprised by the doughty opposition of Bondwell. A feature of the fast and interesting game was the clean football it produced. Result: Bondwell F.C., 5; Highbury Institute, 0. On Saturday, December 17th, Bondwell F.C. oppose Westminster Wesleyan F.C., at Sudbury. All supporters are cordially invited.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The National Association of Opticians.

THE CLOSE OF THE YEAR 1921



HAS BROUGHT IN ITS TRAIN CERTAIN EVENTS WHICH WILL AFFECT MEMBERS AND NON-MEMBERS OF THE ABOVE ASSOCIATION, AND MAKES IT DESIRABLE TO GIVE THE WIDEST IMMEDIATE PUBLICITY TO THE ITEMS OF INFORMATION BELOW.

(1 As July 1922 has been tentatively fixed as the date for inaugurating the new Optical Examinations under the auspices of the above Association, June 30th, 1922, is the last day that Sight Testing Opticians will be accepted as members on the present basis and conditions.

(2) As only members of Optical Organisations are invited to serve on the Panel of Opticians set up by the National Insurance Beneficent Society, it is to the material interests now, and an added protection and security for the future, for all unattached Sight Testing Opticians to become members of the National Association of Opticians.

(3) Owing to the great increase of clerical work, a salaried Secretary has now been appointed by the N.A O. and all correspondence after Dec 31st should be addressed to Mr. L. MORETON PARRY, M.P.S., 163, Oakfield Road, Liverpool.

Annual Subscription 21/-, which includes free delivery of "The Optician."

Up to Dec. 31st, but not after that date (see above), communications can still be sent to the Hon. Secretary, 17, Rathbone Road, Liverpool.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Say "Shur-on" to your Wholesaler!

¶ It is the name of a family of optical products covering more than 996 styles and types of eyeglasses, spectacles and cases.

¶ It is your guarantee of Quality—of a Quality which has been beyond question—ever since 1864.

¶ It is your strongest sales ally, for every time you deliver a mounting, bridge or case bearing the Shur-on imprint to a patron, you are delivering 100 per cent. satisfaction. You are planting the seed of a word-of-mouth goodwill, which will prove of inestimable value to you.

¶ Be critical—say "SHUR-ON" to your wholesaler. Shur-on products cost no more than ordinary kinds.

Shur-on Optical Co.,

Rochester, N.Y.,

U.S.A.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Foods Under the Microscope.

Some Interesting Results of the Ocular Analysis of Alimental Substances.

By L. A. HAUSMAN, Ph.D., Cornell University,

By means of the unassisted eye alone it is possible, as we all know, to recognise gross structural differences between large fragments of animal and vegetable substances, and to refer them to their proper sources. When, however, such materials are finely ground or pulverised, or made into what seem almost homogeneous pastes, or cakes, then the problem of determining the sources of their constituent materials becomes a different one. And yet, it is not different in principle, but only in kind, for we still use the eye as the chief means of analysis, but with its ocular power enormously increased by the aid of the compound microscope. Through this powerful instrument most substances can be seen to be what they really are, and can be made to yield up the secrets of their derivation.

There are but a meagre number of foods (liquids, of course, excepted) which may not be analysed by means of the microscope. The presence of extremely minute quantities of a substance may be detected in admixtures, apparently of perfect purity. Thus one part of turmeric has been detected in 448 parts of mustard! Again, from the size, shape, and structure of the pollen grains within a sample of honey it is possible for the microscopist to determine the sort of flowers which have yielded the original nectar to the bees; and, furthermore, from the form and structure of the crystals in the mass, to say whether the honey has been adulterated with sugar, and to what extent.

The field of analysis over which the use of the microscope can be extended is surprisingly broad, and its boundaries are constantly widening. Almost without exception, any substance, save a clear pure liquid, when properly prepared for and examined under the microscope, will render up to the observer the secrets of its original source or sources. Furthermore, by the examination of accurately known quantities of a substance containing adulteratives, the percentages of the various substances present can be accurately stated. This was recently brought out clearly by a series of examinations by the author of samples of different flours, where the starch grains could be counted, much as blood corpuscles are counted by the physiologist.

In many cases, of course, the examination of food and other substances requires preparation, and special methods of utilising the microscope and its accessories. There are many others, however, in which comparatively simple manipulation is sufficient.

The examination of substances by means of transmitted light is used for starch grains, and similar objects which are transparent or translucent. The substance on the slide is often mounted in water, alcohol, xylol, glycerine, Canada balsam, celloidin, or in various microscopical oils, and is covered with a cover-glass. In examination of substances which are opaque or nearly so, the light which travels up the microscope tube to the eye of the observer cannot pass *through* the object on the stage, but must be reflected upwards from its surface by a source of illumination placed above. These are the two primary ways of lighting objects for examination under the microscope. Many modifications of these two fundamental methods of illumination exist, demanding special apparatus. Upon trial, it will be discovered that each substance requires its own special manipulation of preparation, illumination, and magnification to secure the best results.

With the ordinary compound microscope two objectives, the 16 millimeter and the 4 millimeter; and one ocular, usually the 8 times or 8 power, will afford sufficiently great magnification for analytical work.

An indispensable piece of apparatus for those wishing to do accurate work in identification, particularly of substances which closely resemble one another, is the comparison ocular. This is fitted to two microscopes, in such a way that the two samples under observation reflect their images into the single ocular; each microscope, that is, exhibiting half of its circular field to the eye of the observer. Thus two preparations, on slides, can be enlarged to equal magnitudes and brought close together for intimate and detailed comparison within the same microscopic field. The utility of such a device will be at once apparent.

The microscopist who is called upon to examine and pronounce upon the constituents of a great number of diverse substances must

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

have a fundamental knowledge, at least, of the appearance of the various basic animal and plant tissues. Some knowledge of botany is here presupposed, as well as of zoology, and the form and structure of certain crystals of chemical substances. The comparison ocular often makes easy the identification of unknown fibres, cells, or crystals. In some papers of recent publication, the author has pointed out also how a knowledge of the microscopic structure in the hair of the fur-bearing mammals can be used to identify the species of mammal from which the hair was derived, and in this way to detect imitations.

Characteristic Starch Grains.

One of the most important substances from the food point of view is starch. It is one of the most widely distributed elements in the content of plant cells. Careful researches by botanists have shown that the starch grains of any particular plant are characteristic of that plant in shape, size, and structures of various sorts. Thus each plant bears its own characteristics in its starch grains, and these may therefore indicate their origin. The value of such differences in starch grains to the microscopist is apparent. Since starch grains are present so universally in vegetable substances, it is almot impossible to include, in a food preparation any vegetable substance, without including also its tell-tale starch granules. And if, by chance, or design, some portion of any plant is used (such as the husk, etc.), where starch grains may not be present, the structure of the cells of which the tissue is composed can be just as readily used as a basis for identification. An eminent microscopist recently remarked to the author: "Very few secrets, dealing with the composition of material things, are safely hidden from the man with a microscope."

It is the characteristics of the form and the structure which the microscopist looks for, in identifying starches, rather than for size. However, the *average* sizes of starch grains from different plants (of different parts of the same plant) can be compared, often with results of value in establishing, or supporting, identities or differences.

The question has often been asked whether it is possible to distinguish between food substances which have undergone the process of cooking, in various ways. In most cases, yes, Heat, either moist or dry, affects starch grains, as well as other vegetable and animal substances in different ways and the identification of such modified substances is merely a matter of study. For example, in dry heat the grains simply split up, but in any preparation except one completely charred into carbon, retain enough of their "personalities" to be recognisable.

Coffees are among the food materials most largely adulterated, and here the microscope is an invaluable aid in detecting at once the presence among the coffee-bean fragments, parts of other vegetable substances. No starch is present in the coffee-bean, but other characteristic structures are there which serve as guides to identification.

Tea also has its adulterants (as what food does not!), and here again detection is not difficult. The detection of leaf adulterants in tea is based largely upon the differences in the character of the epidermis, or "skin" of the leaf. In the lower epidermis, especially, comparison is easy, for this lower integument of all leaves which are associated with tea as adulterants, bears large guard-cells surrounding the stomata, or breathing pores in the leaf. These, together with the shape of the cells of the lower epidermis itself, offer almost infallible indices to the species of plant from which the leaf was derived.

Visual Equivalence of Lenses.

We are sorry we must ask readers of Mr. Mayer's article in last week's issue to correct three misprints. Near the end of the first column, where $D = -20^{d},00$, a meaningless *y* has been introduced by the printer. Below we have $b = 0^{m},^{m} 8$, and not .9 as printed. At the end of the right hand column, the value of sin A′ is rightly printed, but a letter *l* is dropped out from its corresponding place in the approximate value of A′ below.

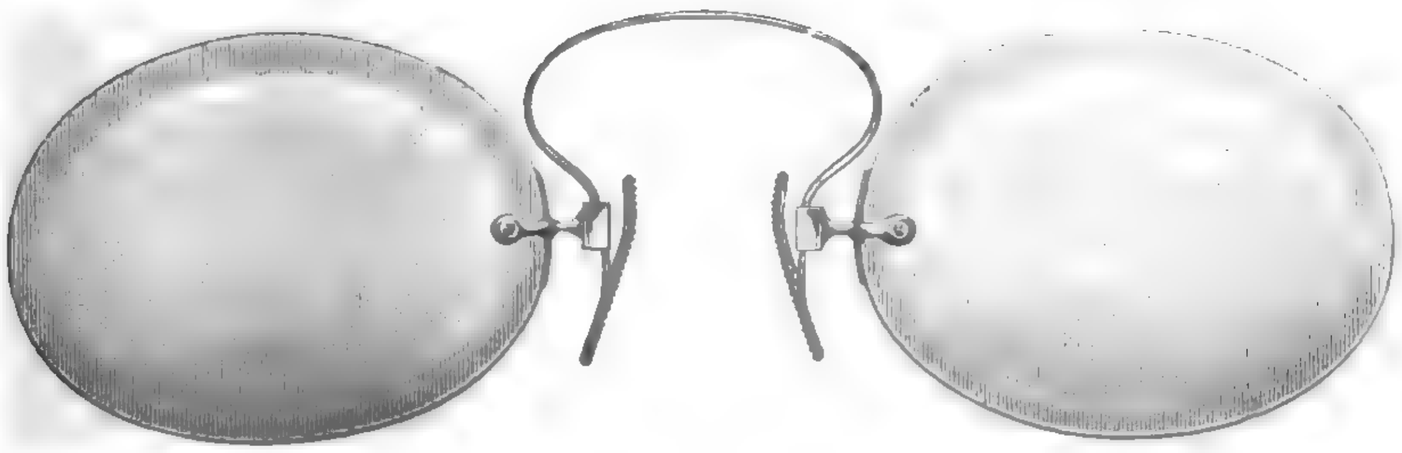
"An Optical Nomogram."

Our attention has been drawn by the author to a misprint in the article we published on October 28th last, "An Optical Nomogram," by Mr. J. A. Tomkins, A.R.C.S. On p. 142 near the top of the second column what should have been printed was "it is not difficult to show that in general the minimum distance is $f + f' + 2\sqrt{ff'} \pm t$." In our printer's version we regret that the whole of the last two terms were included under the radical sign.

You cannot afford to do without THE OPTICIAN. As a manufacturer you need be acquainted with all published information bearing on design and on workshop technique. As a merchant you require to be kept informed of the latest novelties in spectacle-work and scientific instruments, so that you may be able to deal intelligently with all enquiries on these matters. As a sight-testing optician you want to know what is newest in connection with the refraction of the eye and the prescribing and fitting of spectacles. If you are interested in any way in the optical industry, you must keep abreast of its development by reading the technical and other trade news which is to be found only in THE OPTICIAN.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Lyon's
"Standard" Offset Mounts
For Accurate Fitting and Exact Alignment
Optically Perfect.



No. 893 GOLD No. 1293 GOLD FILLED.

Smart in Appearance and Comfortable to Wear.
Easily Adjusted.

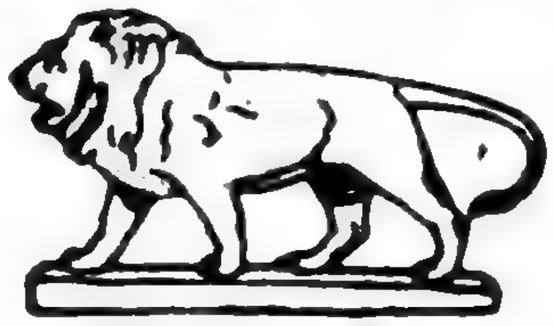
FULL STOCK OF STUDS, SPRINGS AND GUARDS. FITTING SETS SUPPLIED.

F. H. C. Lyon,

Wholesale and Manufacturing Optician,

59-61, Hatton Garden, London, E.C.1

Telegraphic Address:
CYLTORREXO, SMITH, LONDON.



Regd. Trade Mark.

Telephone No.:
HOLBORN 1203.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

"You Cannot TRADE SQ MARK *Buy Better"*

STEVENS' QUALITY Optical Goods

UNQUALIFIED approval meets this celebrated line wherever introduced.

WE are sole agents for the United Kingdom and can invariably supply your requirements from stock.

One Quality Only—The Best Made

1/10th 12ct. Gold Filled

Specialising in the Fingerpiece Mount

Send us your enquiries for
Spectacles and Eyeglasses—Frames and Mountings

Complete Catalogues on Application

H. WILLIAMSON Ltd.

Optical Section

87/89 GREAT SAFFRON HILL, LONDON, E.C.1

General Optical Supplies—Prescription and Repair Work—
Fittings and Instruments—Optical Machinery

Digitized by Google Original from THE OHIO STATE UNIVERSITY

WHOLESALE TRADE ONLY.

W. Smythe & Co. Ltd.

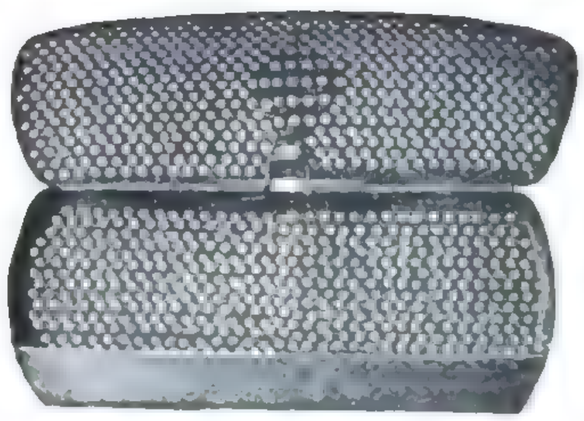
Head Office :
66 and 67, EDWARD ST. PARADE,
Birmingham.

Branch Works—HOCKLEY and WALSALL.

Patent Optical Case Manufacturers

Telephones: 5587-2354 CENTRAL. Telegrams & Cables: "NOWATE, BIRMINGHAM."

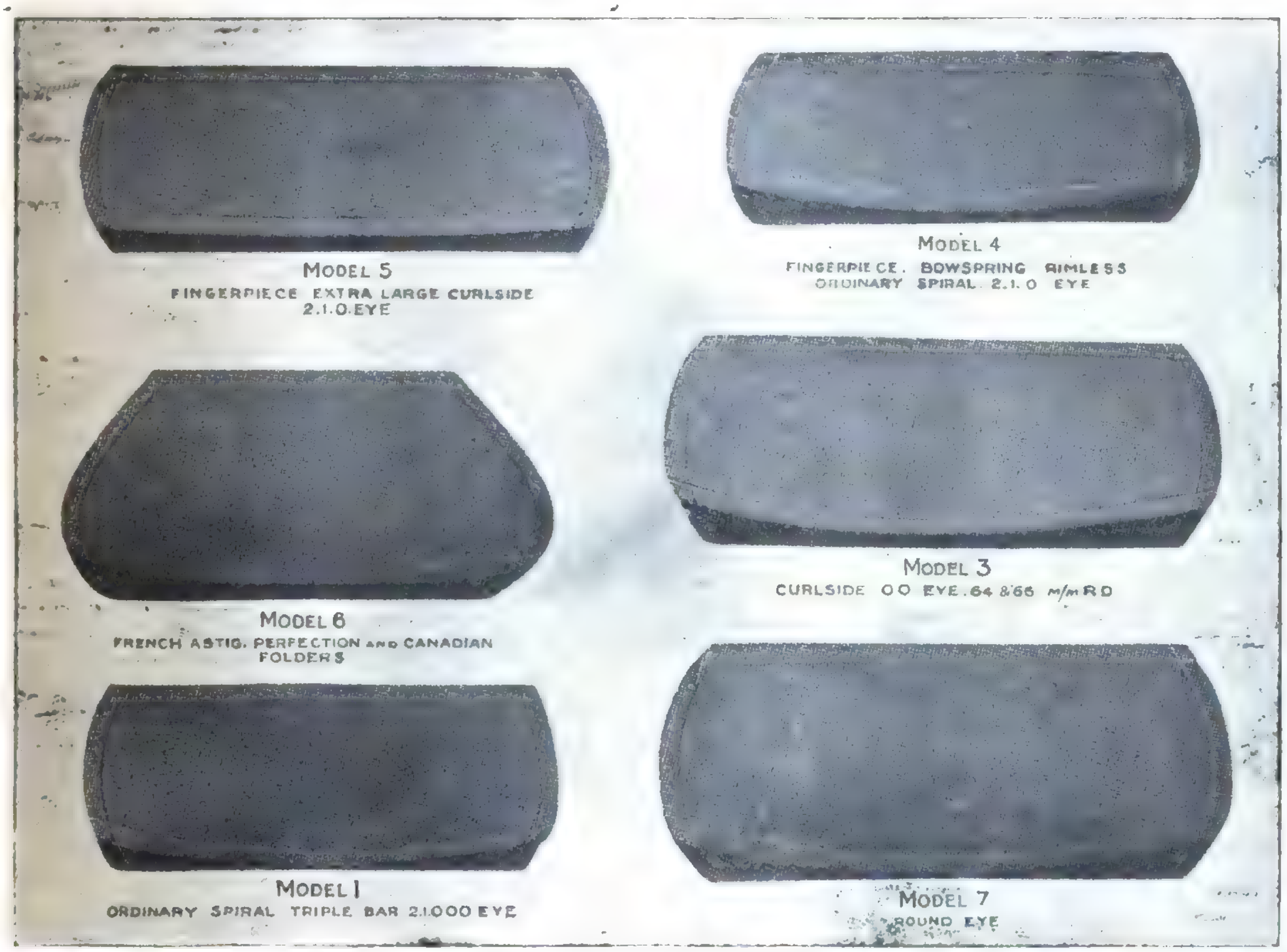
The Patent
"NOWATE" Body



Advantages :

Light as Aluminium and Cheaper.
Stronger than Aluminium and Steel Bodies.
Leather and Lining does Not Peel Off.
Specially Suitable for Export and Hot Climates.

Patent Metal Spring Lid.



ILLUSTRATIONS HALF-SIZE. COMPETITIVE PRICES.

Also Makers of Frogmouth and Soft Leather Cases. Write for List and Prices.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

D.B.O.A. and F.S.M.C.

Tuition by post under Expert Tutors. Courses for Diploma Examinations. Short period classes before each examination are given at Manchester. Residence provided.

Apply for particulars to Secretary,

PENNINGTONS, University Tutors, 254, Oxford Road, Manchester



OPTICAL BLOCKS

To illustrate all features of Optical Service. Write for Lists.

Chemists' Design Service,

12, Humberstone Gate, Leicester,

PRESCRIPTION SPECIALISTS.

Midland Lens Co ltd

ALSO UNCUTS. TORICS A SPECIALITY.
DALE STREET, COVENTRY.

PERCY S. DE SAULLES.

Manufacturer of . . .

MICROSCOPICAL GLASS SLIDES.

Micro Cover Glasses, Glass Cells and Cavity Slips, etc.

The Platts, Amblecote, Stourbridge.

C. BAKER 244 HIGH HOLBORN LONDON

Microscopes & Accessories

PHOTOMICROGRAPHIC APPARATUS, APLANATIC MAGNIFIERS, Etc.

WRITE FOR LIST AND TERMS,
Post free on application.

Estab. 1765

DIXON & HEMPENSTALL,

Wholesale and Manufacturing Opticians,

12, SUFFOLK STREET, DUBLIN.

Telegrams "Optics, Dublin."

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
C. O. DYMOND, M.I.Mech.E., F.I.C.P.A

W. P. THOMPSON & CO.,

12, CHURCH STREET, LIVERPOOL.

Chartered Patent Agents.

H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

T. WHEELER,

Scientific Instrument Manufacturer,

Specialities: POCKET SURVEYING and AERONAUTICAL ANEROIDS.

217, GOSWELL ROAD, LONDON, E.C. 1

ESTABLISHED 1878 TELEPHONE CITY 419

G. R.

By Direction of the

DISPOSAL AND LIQUIDATION COMMISSION

through the agency of the Joint Council of the Order of St. John of Jerusalem and the British Red Cross Society.

SURPLUS MEDICAL STORES FOR SALE by Tender.

Offers are invited for the purchase of these stores as a whole, or by sections as detailed below. The main stocks are concentrated at C.S.D. Depot No. 5, Wood Lane, Shepherd's Bush, London, W.12, where they will be open to inspection from 16th December to 31st December 1921 inclusive, from 10 a.m. to 12 noon and from 2 p.m. to 4 p.m. (Saturdays to 10 a.m. to 12 noon). The Stores which are in sections as under have been listed and offers should be made for the whole of the items listed in one or more of these sections:—

SECTION 1.a. SURGICAL INSTRUMENTS, STERILISERS etc.
,, 1.b. DENTAL APPARATUS, APPLIANCES & MATERIALS
,, 11.a. X.RAY and ELECTRO-MEDICAL APPARATUS.
,, 11.b. CHEMICAL BACTERIOLOGICAL and PATHOLOGICAL APPARATUS.
,, 111.a. ASEPTIC FURNITURE.
,, 111.b. SURGICAL APPLIANCES and SUNDRIES.
,, 111.c. RUBBER AND WATER PROOF GOODS.
,, IV.a. MEDICINES AND MEDICAL MATERIAL.
,, IV.b. TABLETS AND PILLS.
,, V. OPTICAL APPARATUS, SPECTACLES, LENSES, &c

Applications for permits to view should be addressed to:—

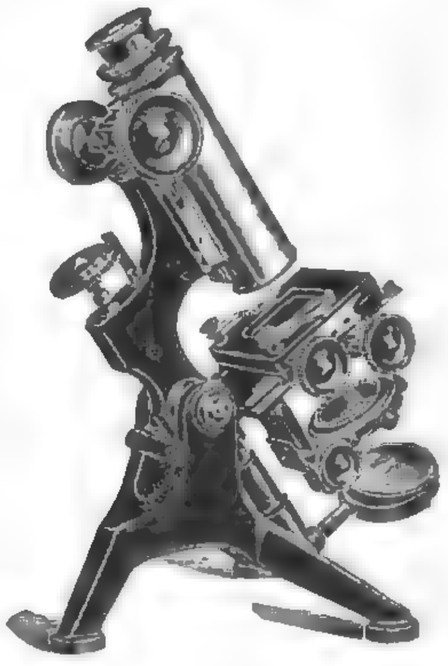
RED CROSS MANAGER, C.S.D. No. 5, Wood Lane Shepherd's Bush, London, W.12

Copies of the Shedules of Stock concerned may be obtained at the Depot by intending purchasers. All offers to purchase must reach the Red Cross Manager at the Depot before 10 o'clock a.m. on 16th January, 1922. The Disposal and Liquidation Commission do not bind themselves to accept the highest or any tender.

SELL WATSONS' BRITISH-MADE

MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,

313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1937.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Mark **Dicol** *of Distinction*

Only High Grade
and High Quality

BINOCULARS

have this mark.

Full particulars from
DAVIES COLEMAN & Co., Ltd.,
45 & 46, Fetter Lane,
London, E.C.4

Telephone : HOLBORN 2597.

Elliott Optical Co.,

104 & 105 GT. SAFFRON HILL,
LONDON, E.C.1

TRADE **EC** MARK.

There is no Better House for

Rx Work.

RXS. RETURNED PROMPTLY,
ACCURATELY DISPENSED
and at REASONABLE PRICES.

Complete Outfit of Rx Stationery supplied,
Free of Charge.

Rx

SANDRO LOWY

Optical Rx Specialist,
88, Goswell Road,
LONDON, E.C. 1

Telephone: CITY 304 (two lines)

Telegrams: SANOPTIC, LONDON.

Rx

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is 3d. per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

BALL RACES, 1⅛in. x ¼in., ⅛in. or ¼in. bore, sample 1/6 post free. F. J. Lee, Steventon, Berks.

WANTED, trial case, lenses mounted, also automatic rimless edger. Full particulars and price. E. Bush & Co., Sunbridge Road, Bradford.

WANTED, second-hand trial case, good condition. Also 3-cell trial frame. Miss Heather, 9, Canadian Avenue, Catford, S.E.6.

FOR SALE. Half-plate stand camera, mahogany, 10" ext. Beck-Steinheil Unofocal Ser. 1., No. 5. *f*/6 with Beck Celverex shutter, T.B. to 1/80 sec., 3 mahogany double dark slides, stand, focusing cloth, waterproof case, the whole £3 10s. Also ¼-plate Holborn reflex, magazine 12, Ilex, R.R. *f*/77. T. and I to 1/100 sec. Leather case, £2. Please address, Box 3508, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

ESTABLISHED Optical Business for sale, average £2,000, low rental. Genuine reasons for disposal, Lancashire. Box 3510, c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 8*

FIRST-CLASS Assistant required by West End Opticians, good prospects. Apply Box 5787, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED for abroad, experienced sight-testing optician, qualified preferred. Apply, Lawrence & Mayo, Ltd., 19, New Oxford Street, W.C.1.

YOUNG Lady, D.B.O A., F.S.M.C., with general optical experience, desires a position in London, moderate remuneration. Box 5790, c/o "The Optician," 125, Fleet Street, E.C.4

The Optical Society.

President: Mr. R. S. Whipple, M.I.E.E.
Vice-Presidents: Prof. Frederic J. Cheshire, C.B.E., Director of the Technical Optics Department of the Imperial College of Science and Technology, South Kensington; Sir Herbert Jackson, K.B.E., F.R.S.
Hon. Treasurer: Mr. I. G. Aitchison, B.A., LL.D.
Hon. Secs.: Mr. L. C. Martin, B. Sc., Imperial College of Science and Technology, South Kensington S.W.7 and
Papers' Secretary: Mr. F. F. Bryson, M.A., B.Sc.

MANY SUCCESSES IN THE EXAMINATIONS!
Your Opportunity to
QUALIFY IN OPTICS
PRACTICAL WORK. Students taking the Course may receive personal tuition in the practical work AT ANY TIME DURING THE COURSE.
Expert Tuition by Correspondence for the SIGHT-TESTING DIPLOMAS of the Worshipful Company of Spectacle Makers (F.S.M.C.), or the British Optical Association (D.B.O.A.).
Write for full particulars—
C. A. SCURR, M.P.S., F.S.M.C., F.I.O., etc.
64, High Street - - - - BARNET.

Don't tolerate it!!
If in your opinion your work is not being returned as fast as might be —just try the Willesden Way.
Address your next box of jobbing to W.O.W.—see what they can do.
You have the Willesden guarantee for quality—all the time, and the difference in price is in your favour.
Willesden Optical Works, Ltd.
Lens Factory, Dudden Hill Lane, N.W.10

FINEST
ROUGH CYLINDER BLANKS,
Also good 2nd Selection
A very attractive proposition for Export and cheaper work.
CHANCE'S GLASS USED.
ACTUAL MANUFACTURERS
ASSOCIATED OPTICAL WORKS, Ld.
5, Queen's Buildings, London, W.1
Near Tottenham Court Road.
No Connection with any other Firm. Telephone: Museum 2216.

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.
STERLING ACCEPTED AT PAR.
COMMERCIAL OPTICAL Co.,
DANDURAND BLDG., MONTREAL.
Cable "Optical" A.B.C. Code 5th. Edition.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

L.O.C.

Pin your faith to L.O.C. for all your Rx Work and you will have frequent cause for self-congratulation.

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris. France.

Also at—2, Str. Bursei, Bucharest, Roumania.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

A.—**Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

RIMLESS Fitters. Good man wanted by R. Archer & Sons, Ltd., 1, Amwell Street, E.C.

ASSISTANT, Qualified, wanted for sight-testing, knowledge of workshop, age about 25, London district. Send full particulars of experience, salary required and photo to Box 5765, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, energetic traveller for town. Good salary to suitable man. Apply, in confidence, to London Optical Co., 344/54, Gray's Inn Road, W.C.1.

YOUTH, 19, requires situation where further knowledge of optics could be obtained, has had three years' experience in Jeweller Opticians. Witham, 20, High Street, Abingdon.

LOCUM TENENS, retired, elderly, experienced, qualified sight-tester and practical rimless fitter, requires occasional employment, days, weeks or months, any time or distance. Apply, Box 5786, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS rimless fitter required. Apply personally to Messrs. Newbold & Co., 72/74, Gray's Inn Road, W.C.1.

RIMLESS Edger and fitter accustomed to best class work required immediately. Apply, giving age, particulars of experience and salary required to Mr. Reid, 3, Queen Street, Exeter.

WANTED, optician with own workshop used to repairing and cleaning all makes of microscope objectives both low and high powers, including oil immersions. Apply, Box 5789, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., 21, requires position as first assistant. Fully experienced, and can take full charge. Box 5788, c/o "The Optician," 125, Fleet Street, E.C.4.

TRAVELLER required, optical and scientific instruments. Commission basis. Applications, stating district, to Percy R. Clark, 26, Charing Cross Road, London, W.C.

WANTED by West End Opticians, first-class assistant, good opening for energetic man. Apply by letter, Hamblin, 5, Wigmore Street, W.1.

MECHANIC used to meteorological and general instrument work, hand-turning bench, finishing and lacquering. 18 years' experience, any distance, town or country. F. Orford, 83, Ashmore Road, Paddington, W.9.

JOBBER wanted to take charge of small workshop, with very good all-round experience. Reply, full particulars, wages. Benn Franks, 44, Saville Street, Hull.

JEWELLER-OPTICIAN'S Son, 21, passed major portion S.M.C., desires post with optician, London, where good practical experience can be obtained. Vennall, High Street, Chesham, Bucks.

QUALIFIED Opticians wish to recommend their first assistant. Good refractionist and salesman. First-class man for charge of prescription workshop. Box 5780, c/o "The Optician," 125, Fleet Street, E.C.4.

TORTOISESHELL worker requires berth. Good at general repairs, lorgnettes, spectacles, folders. District not essential. Box 5776, c/o "The Optician," 125, Fleet Street, E.C.4.

LADY desires post as clerk, 5 years' general office experience, quick at figures, typing. Good references. Box 5778, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS rimless fitter and glazier, both bevel, shell and rimless, bifocal work, 11 years' experience, seek post. Box 5777, c/o "The Optician," 125, Fleet Street, E.C.4.

SITUATION required by good all-round man, well up in refraction and all repairs and rimless work. Also Kryptoks and cement bifocals. Able to take entire charge. Apply, Box 5781, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST, used to working class trade, good retinoscopist and salesman, 20 years' experience, open to engagement. Optician, 49, Hazlewood Avenue, Newcastle-on-Tyne.

REFRACTIONIST, young lady, age 25, thoroughly experienced in all branches of sight-testing, desires position as assistant to sight-testing optician. Used to sole charge. Midlands preferred. Box 5773, c/o "The Optician," 125, Fleet Street, E.C.4.

LOCUM TENENS disengaged, capable and experienced refractionist, thoroughly reliable and practical workman, used to management. Excellent credentials. Box 5774, c/o "The "Optician," 125, Fleet Street, E.C.4.

ASSISTANT requires progressive berth. Passed S.M.C. examinations except one subject. Good refractionist and salesman. Can do all repairs. In or near London preferred. Box 5779, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST, age 28, requires position with retail optician, awaiting result of B.O.A. examination. 6 years' sight-testing experience and thorough knowledge of photography. C.R., 76, Charlwood Street, Pimlico, S.W.

D.B.O.A. London man of good address, over 15 years' experience, expert in sight-testing and fitting, smart salesman, at present managing branch, seeks change, similar capacity. South Coast or London preferred. Box 5784, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, age 19, requires position, good testimonials. Able to do all Rx work, repairs, and attend customers. Would be indispensable to retail optician doing own jobbing. J. Gasson, 52, Battersea Park Road, S.W.11.

ALL-ROUND Jobber, rimless fitter and V-edge, etc., seeks situation in Glasgow. Box 5783, c/o "The Optician," 125, Fleet Street, E.C.4.

RETAIL or Wholesale position in London required by unqualified refractionist, 9 years' experience, including management of general optical trade. Good appearance and address, thoroughly reliable in every way. Studying for S.M.C., only reason for seeking change. Box 5771, c/o "The Optician," 125, Fleet Street, E.C.4.

SITUATION required by young lady with West End retail optician. Five years' experience with qualified optician, smart saleswoman, can neutralise, do small repairs and frame fitting. Reply, Box 5770, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION as branch manager or first assistant required in London or suburbs. Passed S.M.C. examination excepting one subject, careful refractionist O. & S. methods. Can do all repairs, also edging and fitting. Good all-round knowledge, own test case, etc. Box 5767, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED Refractionist (F.S.M.C.), keen and energetic, age 33, good address and appearance, desires engagement. Careful tester, with clinical experience, London or near preferred. Apply, Box 5766, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACER (all-round) seeks situation (male). Box 5764, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED by qualified optician, responsible position offering scope for accurate refraction, first-class salesmanship and energetic organising. In or near London. Box 5752, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED Young lady required for prescription department. Box 5736, c/o "The Optician," 125, Fleet Street, E.C.4.

... page 6

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE MIDGET



OPERA GLASS

(Licensed under Patent 12148 1912.)

(Actual size of Illustration.)

Perfect Interpupillary Adjustment.
Superior Lenses.

Claims immediate attention and commands ready sale.

Choice variety:—BLACK MOROCCO, GILT, FANCY LEATHER, PEARL, etc.

WRITE FOR SAMPLE.

R. ARCHER & SONS, Ltd.,

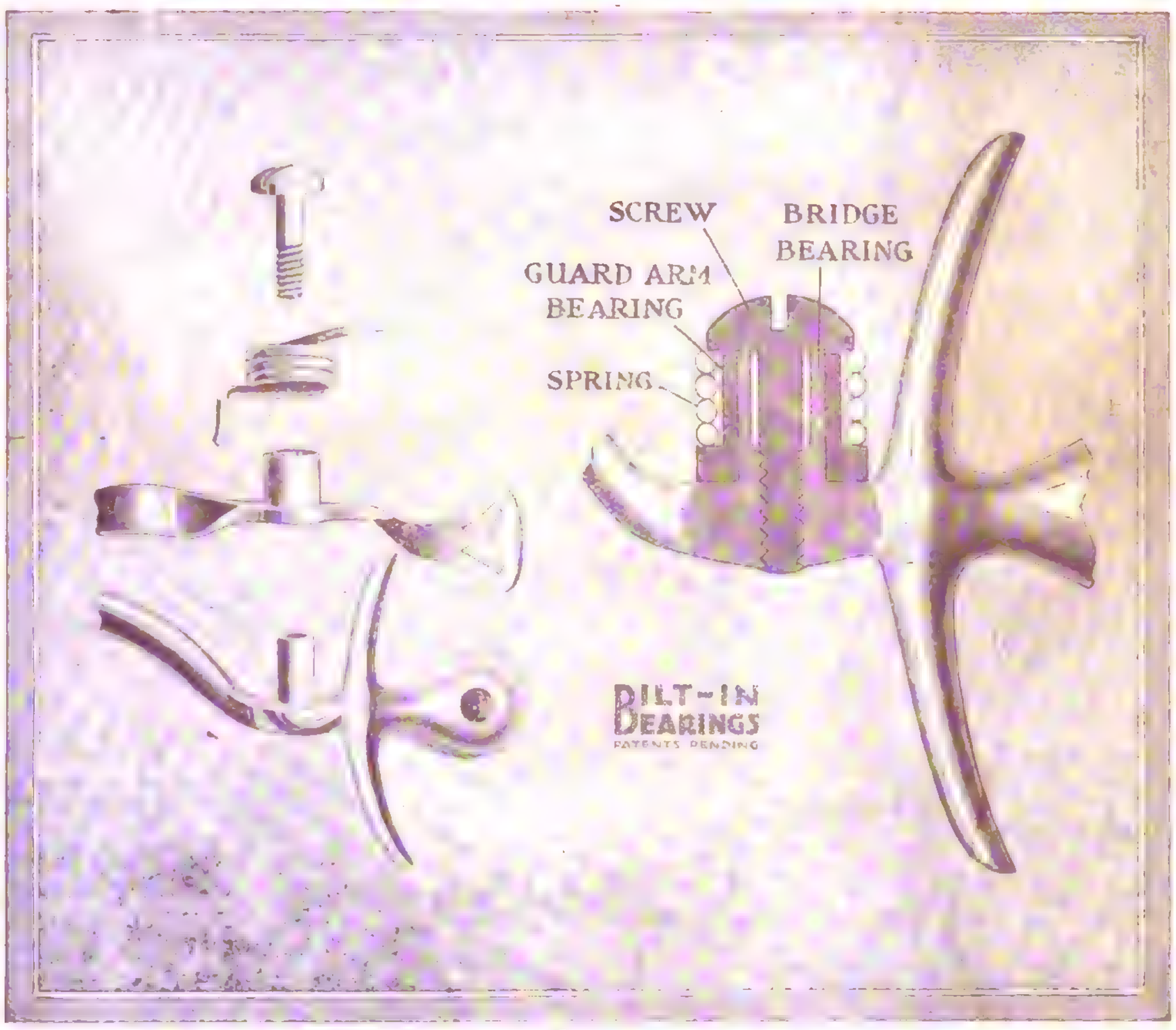
1, AMWELL STREET, LONDON, E.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE OPTICIAN
Reg. at G.P.O. as a Newspaper

AMERICAN·OPTICAL·COMPANY, LIMITED.



Imagine assembling a fingerpiece mounting with your fingers, absolutely without fuss or annoyance. That's what you can do with the Bilt-in Bearings FITS-U.

Bilt-in Bearings assemble automatically and align positively without delicate adjustments. The two telescoping tubes turn the trick which is accomplished in a jiffy.

The beauty of Bilt-In Bearings lies in the simplicity. They are simplest where ordinary mountings are most complicated. And are strongest where other constructions are weakest. Bilt-In Bearings always work on their broad bearing surfaces without binding or strain. Friction is reduced to a negligible quantity.
These are stocked in solid Gold, 1/10th 12 ct. Gold-filled and Alumnico (high grade of white metal)

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C.4. (Printed by The Century Press, Fulham). Dec. 16, 1921.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1604 FRIDAY, DEC. 23, 1921.

ROSS BINOCULARS.



British Government Tests have proved these to be the finest Binoculars in the world.

Send for our new catalogues and terms.

ROSS Ltd., Clapham Common, LONDON, S.W. 4

ELLIOTT'S Rx SERVICE

leaves nothing to be desired.

ACCURACY—PROMPTNESS and REASONABLE PRICES.

104/5, GT. SAFFRON HILL, E.C. 1



STOCK OPERA GLASSES NOW—

For Pre-duty Prices.

For the Coming Season.

ARCHER SELECTION.

R. ARCHER & SONS, Ltd., 1, Amwell Street, London, E.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

AMERICAN·OPTICAL·COMPANY, LIMITED.

Wellsworth Eyeglass Chains

For beauty, neatness, service, strength and inconspicuousness, Wellsworth Eyeglass Chains stand out as leaders. They are of a quality unexcelled, and stand the test of hard and continuous use in a creditable manner.





Only materials of the highest grade are used for the production of Wellsworth Eyeglass Chains. This together with careful and skilled workmanship make them of the finest quality.

WELLSWORTH

TRADE Ⓐ MARK (Regd).

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE

PATENT L. W. ORTHOPS 167902.



THE L-W ORTHOPS OPHTHALMOSCOPE

This new instrument is entirely reflecting and eliminates most of the difficulties of ordinary ophthalmoscopy; with the minimum of practice, an excellent view of the fundus is obtained.

The instrument is worked by an ordinary small dry cell battery, measuring $3\frac{1}{4}'' \times 3''$.

It is an instrument that should be possessed by every sight testing optician who wishes to make ophthalmoscope examinations.

It can be obtained from any Wholesale Optical House, from whom a fully descriptive pamphlet can be had on application.

Manufactured by **GEORGE CULVER, Ltd., London, N.1**

A

Digitized by Google Original from THE OHIO STATE UNIVERSITY

J&R F LTD

Some Suitable Lines for the Season's Trade

Immediate delivery from Stock.

Reading Glasses — REAL TORTOISESHELL; LOTOSHELL; SHELLULEX; ALUMINIUM; AMOPTOSCOPES

Spectacle and Eyeglass Cases — TORTOISESHELL; SOLID SILVER; A.O.Co. POLISHED ALUMINIUM

Lorgnettes — TORTOISESHELL; LOTOSHELL; SOLID GOLD; SILVER GILT; ROLLED GOLD

All lines are well finished saleable goods. We keep no others.

J. & R. FLEMING LTD.,

Telephone:
HOLBORN {814 / 815
HOLBORN {2788 / 2789} Prescription Dept.

136-148 Clerkenwell Road,
LONDON, E.C. 1.

Telegrams:
"OTTICO." LONDON.

Branches with Prescription equipment:

WALTER BRAHAM & Co. Ltd.
6, Key Hill Drive,
BIRMINGHAM.
Phone: Central 2500
Telegrams: "Brahma."

37, WESTGATE STREET,
CARDIFF.
Phone: Cardiff 44
Telegrams: "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1065.
Telegrams: "Ottico."

8, CHUDEHILL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

J&R F LTD

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
The Rt. Hon. VISCOUNT HILL, L.C.C.

Upper Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Renter Warden
HARRY HYLTON-FOSTER. Esq., Past Master.

Director of Examinations
The Rt. Hon. SIR WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in May, 1922.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receiv them*

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,604

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, DEC. 23, 1921

Xmas Greetings.—The best of good wishes go out from this office to the friends and supporters of our Journal; and we hope that the season, which to most of our readers has been not unprosperous, will be celebrated in good health, with the usual pleasure that its hospitable character invokes.

* * *

Public Charity.—Unseasonable enough at every time, and particularly ungracious in these days of personal benevolence, the post-war activities of professional charity-mongers are spreading and growing like noxious weeds. The clamancy of a multitude of people who expect ninepence-for-fourpence and more than that, out of the pockets of business men in this country, is exploited by political humbugs, often trading on the merits of men who dared and suffered in the great War. The debt due to such men and to the dependents of those disabled, is so clear a national charge that, of course, it was bound to be seized on to be turned to the benefit of all sorts of undeserving people. The fine phrases of our politicians have conjured up an army of pinchback "heroes" who enjoyed big wages during the War, and now seek to extort not only their trade union rates of pay for good work done, but corresponding benefit in case of the misfortune of unemployment. These extreme Communistic claims are weakening in the natural course of events, under pressure of the economic law; but a wave of pauperism, so widespread that those laved by it are quite unashamed, has invaded the ranks of unskilled and semi-skilled labour

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

in this country; and it gives no sign of receding. Pauperism in the form in which it is now disguised, was organised by Government by the National Insurance Act; and as was inevitable, the "medical benefit" is going to be supplemented in other ways. A first development is seen in the proposal to obtain glasses from sight-testing opticians, at wholesale cost prices plus five shillings payment for service. The proposition to pay professional services at a cut rate is defended on the usual ground of the merits of our deserving working men.

* * *

It was attacked very pointedly by a correspondent in last week's *Optician and Scientific Instrument Maker*; and as we learn that a considerable number of retail opticians have not received the circular from the "National Insurance Beneficent Society," on which Mr. Herbert Smith commented, we are reproducing it this week, numbering the paragraphs for convenience of reference. The communication is printed on p. 276.

* * *

Trade Unionism.—Co-operative insurance is obviously a good thing in itself, when carried out on economic lines; and the only grievance that can be expressed against the National Insurance Act is that it is an outstanding piece of class legislation, designed to confer an unearned increment of benefits on one section of the community at the expense of another. Large schemes of insurance are likely to develop in the future in new directions, among business men and the higher paid classes of wage earners; and the payment for professional services that is an essential part of such schemes will almost certainly involve the establishment of contract rates. There is nothing necessarily bad in such rates, well-known in the legal profession for instance; and any insurance scheme on a really national basis would be forced to conform with an adequate scale of payment for professional services. The present difficulty is that the so-called national scheme, subsidised by all, is specialised to the use of a class which includes most of our trade union workers. And trade unionists display a human but unfair desire to cut down the remuneration of people whose services, in an open market for such services, commands more than something corresponding with the trade union rates of pay.

* * *

Wholesale Prices.—Very little harm may be done by familiarising the public with the net cost of of the class of spectacleware known as "hospital work," as distinct from gold or gold-filled frames or the more expensive forms of lenses. Everyone has seen spectacles of a sort offered for a shilling, or a watch of a sort for five shillings; and thousands of hospital prescriptions are now being filled by opticians at a rate of profit that is merely nominal. But it will be well to keep a clear line of distinction between everything of the order of hospital work and that upon which a refractionist has to depend for earning his livelihood. Clearly, the rate of profit charged on fitting expensive spectacleware must be very different from the minimum scale. Wholesale prices for articles of like materials, vary considerably according to the class of work involved. And in those instances where glasses are supplied at cost price plus a scheduled profit, suitable discrimination is called for in the choice of make. Beyond the merits and demerits of a scheme of contract service that are obvious upon the face of it, we have to look to other possibilities which depend on the method of administration.

The National Association of Opticians.

As we go to press we are advised that a special circular to be issued in a few days to all members of the N.A.O. is on its way to us; but we regret that owing to the exigencies of the season, which necessitate the earlier closing of our columns, we are compelled to omit the publication this week. It shall appear in our next issue.

"Bondwell" F.C. (C. W. Dixey & Son) played at Park Royal on Saturday, Dec. 17th. With four of their regular players absent on account of injuries, the Bondwell F.C. gave a creditable display in a fast and stubbornly contested game. The "Bees" were more convincing and attacked almost continuously, but their shooting was at fault. Result: Westminster Wesleyan A.A. F.C., 2; Bondwell F.C., 2. On Saturday, Dec. 24th, the Bondwell F.C. oppose Willesden Optical Works, at home, Lea Bridge Road. Supporters meet at Radley's Boathouse. Kick-off at 2.30 p.m.

The Western Ophthalmic Hospital (Marylebone Road, W.), advertises that some six thousand pairs of spectacles are prescribed for patients each year.

Death of Mrs. T. A. Reynolds.

We much regret to hear of the death of Mrs. Reynolds, Senior. The funeral took place on Wednesday last from Mr. T. A. Reynolds' residence in Bounds Green Road, Wood Green. The interment at New Southgate Cemetery was attended by many friends,

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE PRINCIPLES AND PRACTICE OF POLISHING.*

PAPER READ BEFORE THE SCOTTISH SOCIETY OF OPHTHALMIC OPTICIANS.

By Dr. J. W. FRENCH.

Rates of abrasion depend upon the kind of abrasive material used, as is evident from several of the illustrations already exhibited. It is not easy to give comparative results for different materials, as much depends upon the conditions and the final character of the surface desired. In fig. 16, however, a comparison is given of carborundum and emery of approximately equal fineness, that is, so far as the average diameters of the grains are concerned. It will be seen that the carborundum is about twice as effective as the 3-minute emery. The coarser the grain, the greater, however, is the relative effectiveness of the carborundum and conversely when the grain approaches the fineness of 40-minute emery the rates are very nearly the same.

Both carborundum and emery are frequently used as abrasives, the carborundum being used in coarse grades for the roughest operations and emery in the finer stages and particularly for smoothing. There is much advantage however in using one type of abrasive throughout as the danger of emery being contaminated with carborundum is thus avoided. When carborundum alone is employed it is essential to instal washing plant that will enable grades of carborundum of the necessary fineness to be obtained. Although fine grades of carborundum when bought in the open market are very costly the coarse grade is comparatively cheap and the cost of washing and separation adds only a few pence to the cost per pound. But it must not be forgotten that the greater effectiveness of carborundum involves greater care in its application. Corundum, which is less drastic, is sometimes preferred.

Smoothing is the next stage in the working of the optical parts. In the rough grinding operation material is removed to the necessary extent and by the use of finer grades of abrasive a ground surface of a comparatively fine texture is obtained, but the ground surface is not necessarily sufficiently true in form. In the case of multiple work where a large number of pieces that have been previously formed are mounted together to be polished, the intermediate smoothing operation has for its object the working of the individual pieces so as to form one uniform and regular surface. As the amount of material to be removed is then small, a fine grade of abrasive is used with the object, further, of producing a very fine ground surface that will not necessitate the removal of much material during the polishing process. Practical opticians will realise the saving in the time of polishing obtained by the expenditure of additional time in smoothing. If the smoothed surface contains any deep holes, it is necessary in the polishing process to remove material to the depth of these holes and this involves much unnecessary labour, as

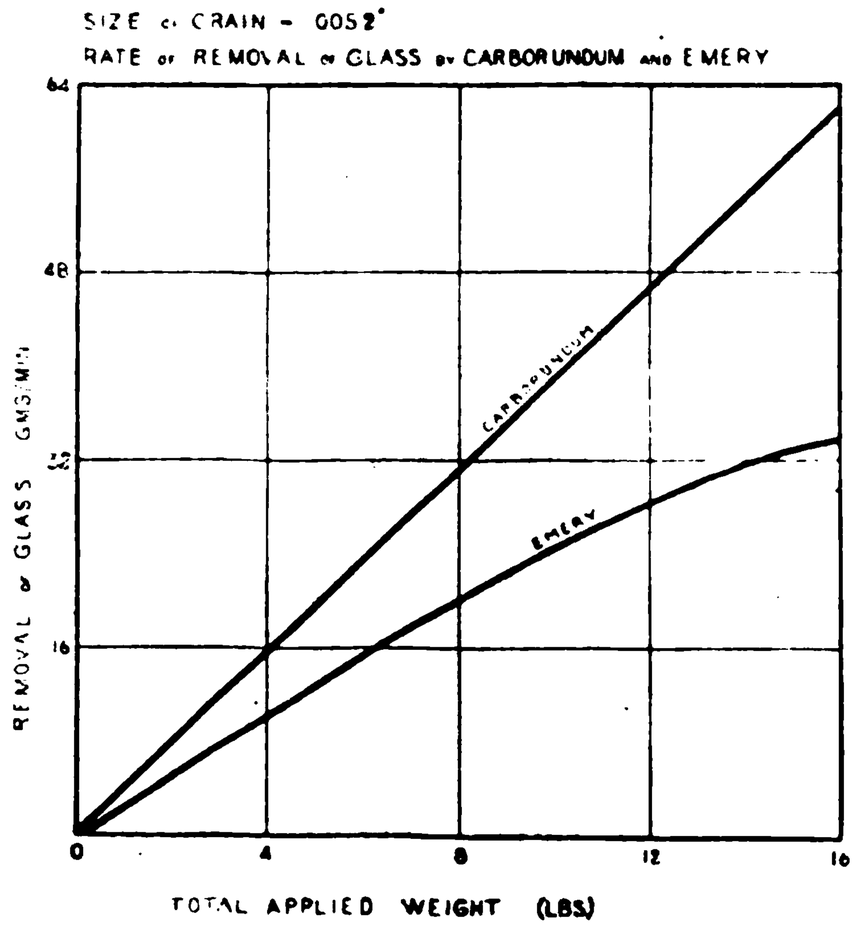


Fig. 16

the removal of material takes place much more quickly in the smoothing operation than in the polishing.

While in the roughing operation there was much removal of material and a very limited surface flow along the ridges of the cavities, in the smoothing operation the removal of material is less and the amount of flow is greater. In the polishing process on the other

*Continued from page 259.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

hand, the removal of material is extremely small and the amount of flow very great; the more the flow of the surface molecules, the more rapid is the polishing action. But it must be clearly understood that, even in polishing, until the very last stage there is a

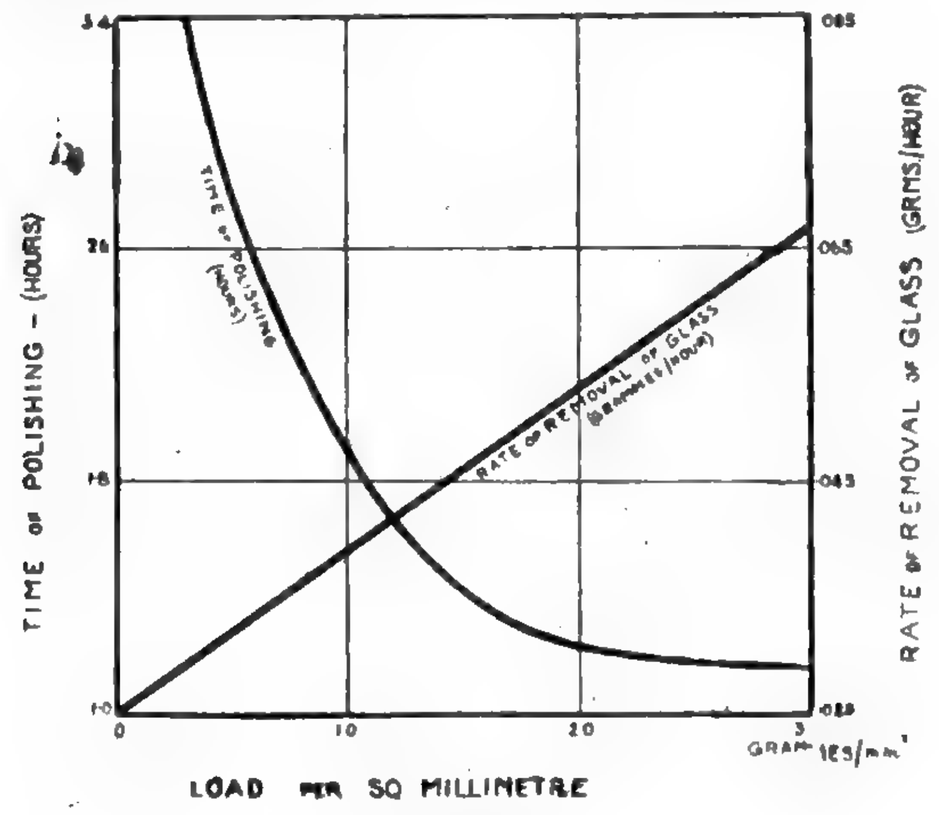


Fig. 17

continuous removal of the surface layer material. This is indicated in fig. 17, which shows how the rate of removal of glass during the polishing operation is affected by an increase of the load on the polishing tool.

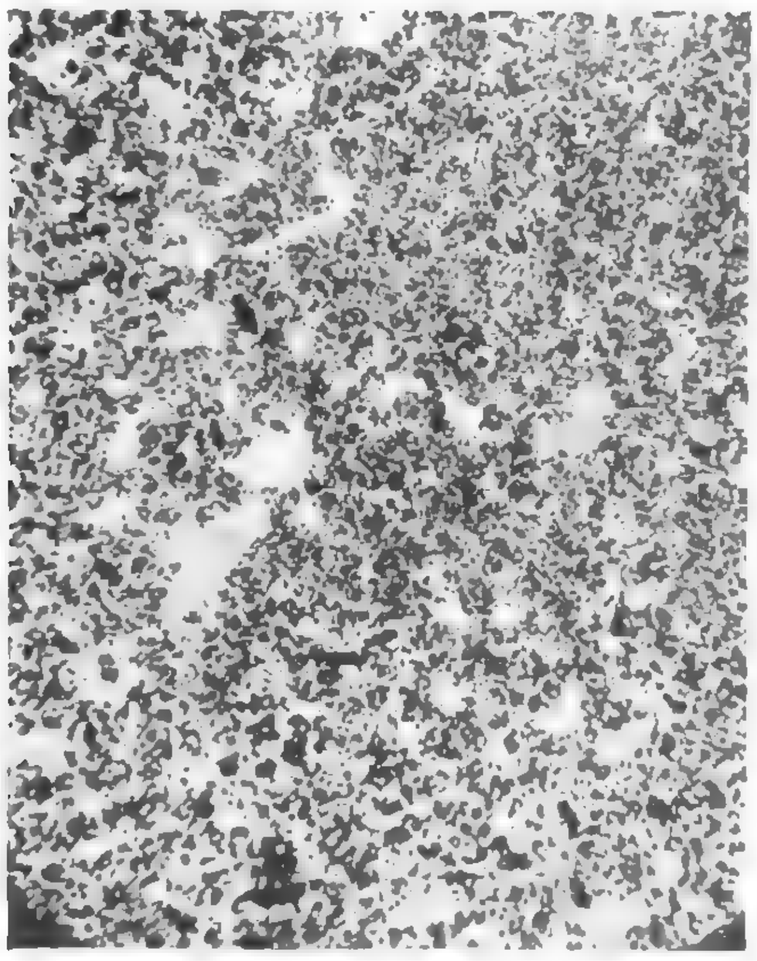


Fig. 18

If the polishing action was that described by Hooke and Newton, it is to be expected that the microscopic examination of a partly polished surface would exhibit every intermediate stage from the rough conchoidal fracture previously illustrated to a polished surface having no visible structure. Such intermediate stages are not apparent, as is clearly indicated in fig. 18, which shows a smooth surface after being polished for about three minutes with a hard polisher. The polished patches are pool-like in character, as described by Lord Rayleigh. The absence of all intermediate stages is evident and it is remarkable that this striking feature should have been overlooked by so competent an observer as Robert Hooke, who was an expert in the use of the microscopes available in those days.

Fig. 19 shows several stages in the polishing of the piece of ground glass illustrated in the centre of the diagram. After five seconds quite appreciable areas of polished glass could

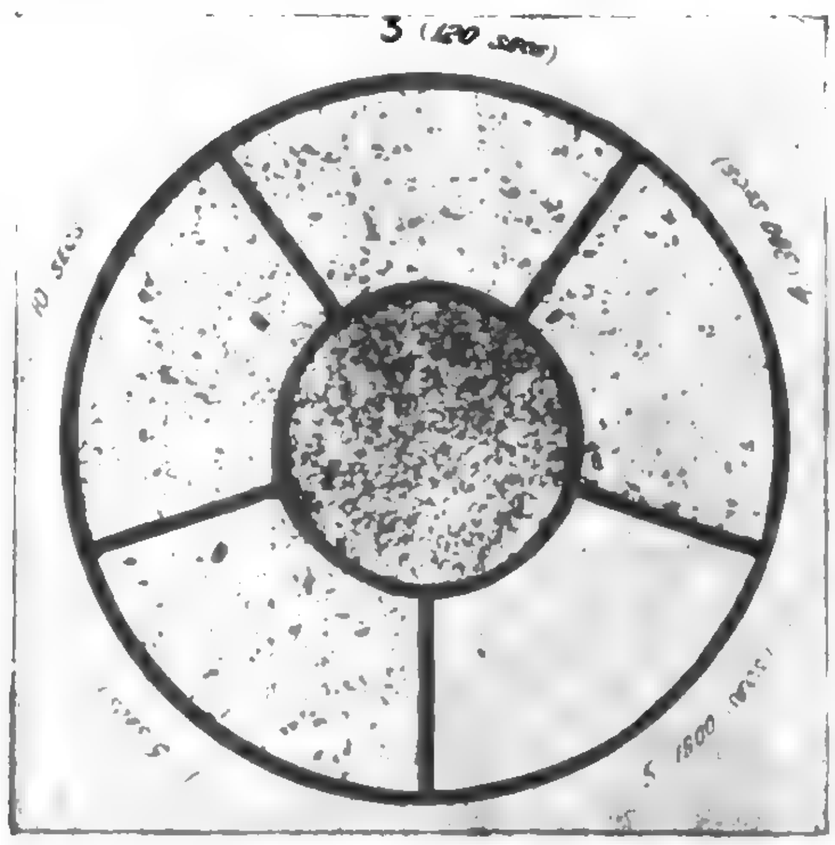


Fig. 19

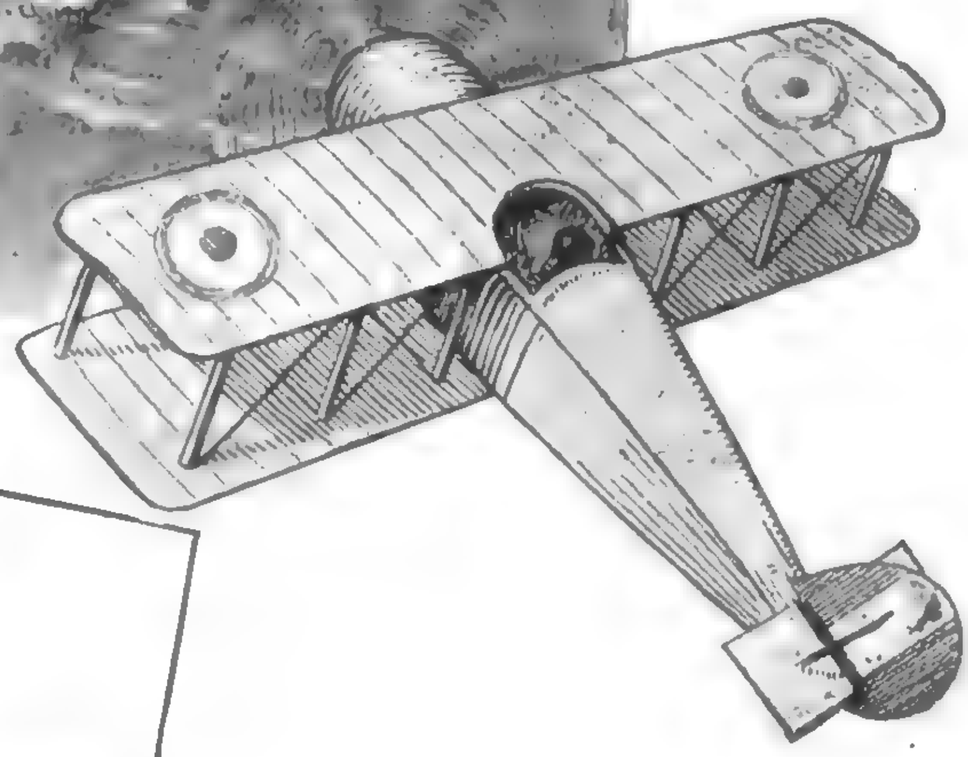
be detected and these polished areas were as perfect as those of the final polished surface. After 120 seconds the polished areas largely predominated. The time of polishing is determined by the time required to work the surface down to the bottom of the deepest holes. After 1,800 seconds there is still one deep pit. In these tests an extremely hard polisher was used for the purpose of emphasising such depressions. Had a soft cloth polisher been employed the edges of the depression in question would have been well rounded and it is probable that the depression, although still there, would have been hardly visible. For the commoner classes of work it is possible to use a soft polisher, but this is hardly permissible in the case of the highest class of optical work.

Cloth polishers of various hardnesses are generally used for ordinary qualities of optical work such as spectacle lenses. For the highest class of work pitch polishers are em-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



The late Sir William Crookes, O.M., F.R.S., to whose researches was largely due the evolution of Chance's "Crookes" Glass.



Chance's 'CROOKES' Glass

never halts in its work of preserving sight against trong natural or artificial light.

If any of your Clientèle are likely to to spend the season abroad, remember that Chance's Crookes "B" is graded for sub-tropical and tropical climates and for snow-glare.

CHANCE BROS., & Co., Ltd,,
Glass Works,
Smethwick, Birmingham.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

"WERTEX"
WILLMOTTS'
LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.



11c 11c

First impressions are important, consequently your Testing Room is made attractive.

Lasting impressions are even more important, so complete a transaction by giving an attractive and lasting case.

Use "WERTEX" Cases.

Details and samples from your dealer or direct from the manufacturers.

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

ENGLAND.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

in the earlier polishing stages. Wax and paper have also been used for many years, indeed, before the introduction of pitch polishers by Sir Isaac Newton. Although Sir Isaac Newton was the first to use pitch for the polishing of his metal reflectors and to suggest its use for glass polishing, it is not altogether clear that he did actually use pitch for the polishing of glass. In his Opticks he states that "an object glass of a 14ft. telescope made by one of our London artificers I once mended very considerably by grinding it on pitch with putty and leaning very easily on it in the grinding lest the putty should scratch it. Whether this way may not do well enough for polishing these reflecting glasses I have not yet tried." In another portion of the same work he states, "Then I put fresh putty upon the pitch and ground it again till it had done making a noise and afterwards ground the object metal upon it as before and this work I repeated until the metal was polished, grinding it the last time with all my strength together for a good while and frequently breathing upon the pitch to keep it moist without laying on any more fresh putty." I would draw particular attention to this last clause which clearly describes the application of water alone in the final stage of polishing, this being present day practice.

Father Cherubin, as indicated in his work entitled "La Dioptrique Oculaire," dated 1671. lined his polishing tools with a variety of materials of fine and uniform texture. More particularly he refers to the use of "very fine leather, fine English fustian, fine holland or other fine linen, silk taffety, or satin." At very great length he describes the process of

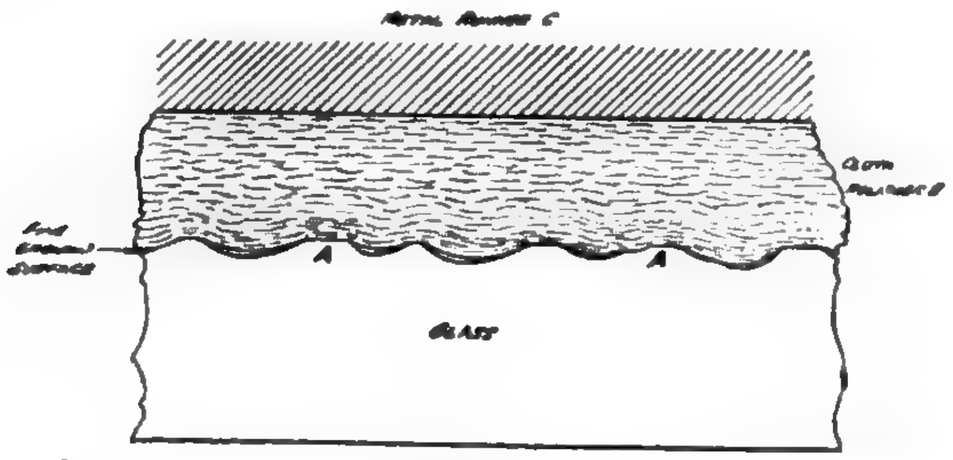


Fig. 20

lining the tools with paper and he emphasises the importance of scraping away with a knife the little hard lumps or irregularities in the texture of the paper.

According to Montucla's "Histoire des Mathématiques" the previous use of paper is attributable to Anthéaulme who used the grinding tool itself after lining with paper as the polishing tool, the medium employed being Venetian tripoli.

The action of a cloth polisher is illustrated in fig. 20, the surface A of the glass being assumed to be only fine ground. Owing to the yielding nature of the cloth, there is a certain amount of contact over the surface of the depressions, the edges of which become rounded off, the final appearance of the polished surface being very similar to the texture of the skin of an orange on a reduced scale. To remove entirely the irregularities of the surface by means of a soft cloth polisher is quite impracticable. When the depressions are very fine the rounding of the edges merely makes them invisible to the unaided eye.

The action of a hard polisher such as a pitch polisher is illustrated in fig. 21. There

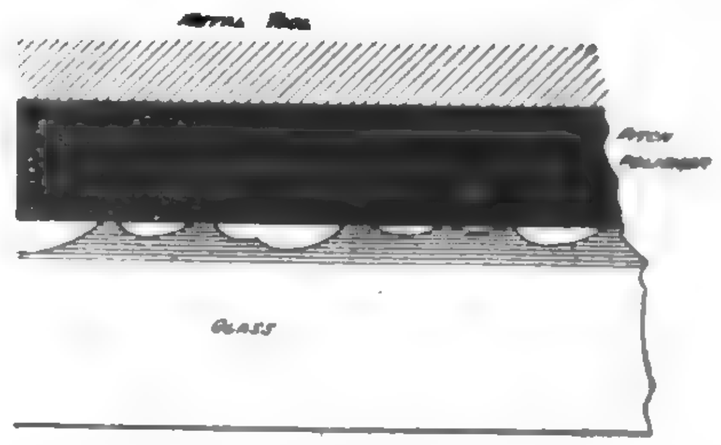


Fig. 21

is in this case very little sinking of the pitch into the holes and it is only the projections that are acted upon. Under the action of the polisher the surface layer assumes an amorphous form and when free to do so the molecules under the surface tension forces flow and produce a truly polished surface. There is reason to believe that the amorphous surface thus produced is much softer as it were, than in its original condition. Grains of rouge readily plough their way through the amorphous layer, with the result that layer by layer the material as it becomes converted into the amorphous stage is removed. To produce a truly polished surface free from any of the original conchoidal cavities, it is necessary, therefore to remove the material layer by layer, down to the level of the deepest hollow; hence the desirability, as previously stated, of very careful smoothing in the case of high class work that is to be polished by means of a hard polisher.

There is a striking difference between a sleek or furrow associated with the amorphous surface layer and a cut or scratch associated with the underlying material.

A good example of a highly magnified sleek is indicated in fig. 22. It will be observed ployed, although cloth polishers may be used

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

that the furrow is very regular and clean with no signs of any splintering along the edges.

Fig. 23 represents a cut in which the removal has been due to the splintering of the glass.

Isolated particles of a good polishing medium such as rouge are almost ultra-microscopic in size. The individual particles, however, collect into small masses which during the first few strokes of working form minute spongy balls well adapted for swageing or ploughing away the amorphous surface layer. It seems to be an essential characteristic of a good polishing medium that it should form into minute spongy balls that are not sufficiently hard to transmit through the surface layer such forces as would splinter the underlying material and produce a cut.

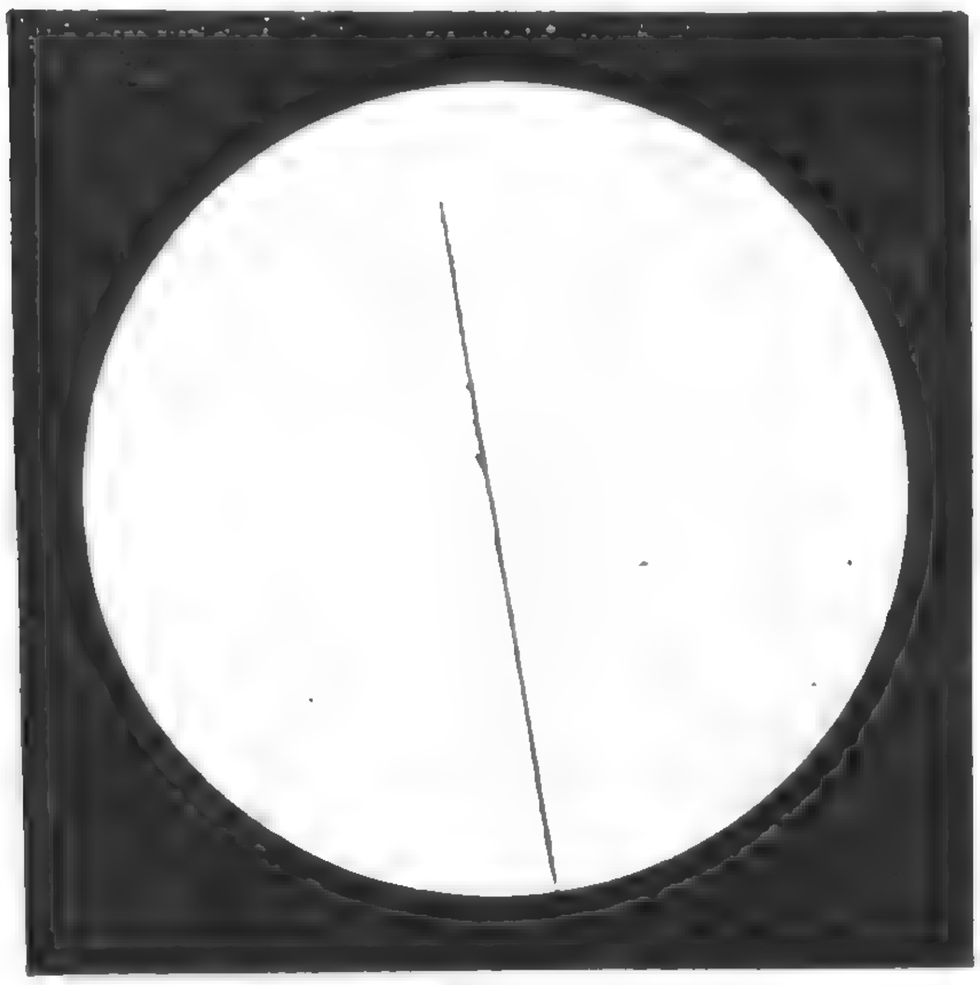


Fig. 22

It is well-known that, if a polished surface is etched, innumerable sleeks reappear. The majority of these so-called sleeks are really series of minute percussion cracks which existed in the finished surface and only became visible after being widened by etching. Some of the marks, however, may be true sleeks, and it has been suggested that they are original sleeks which had been covered by the final amorphous surface layer, as in the case of metals. There is reason to believe that, although sleeks can perhaps be filled up with material, they cannot be bridged over as in the case of metals. For example, in fig. 24 it is assumed that the groove A has been formed by, say, a hard particle during the polishing process and that this groove becomes filled up, as indicated, during each stroke of the polisher. It is to be expected that there will be a residual groove B quite indistinguishable by the eye. As the filled in material is probably most readily acted upon, the original groove A will be reproduced by etching, not merely uncovered.

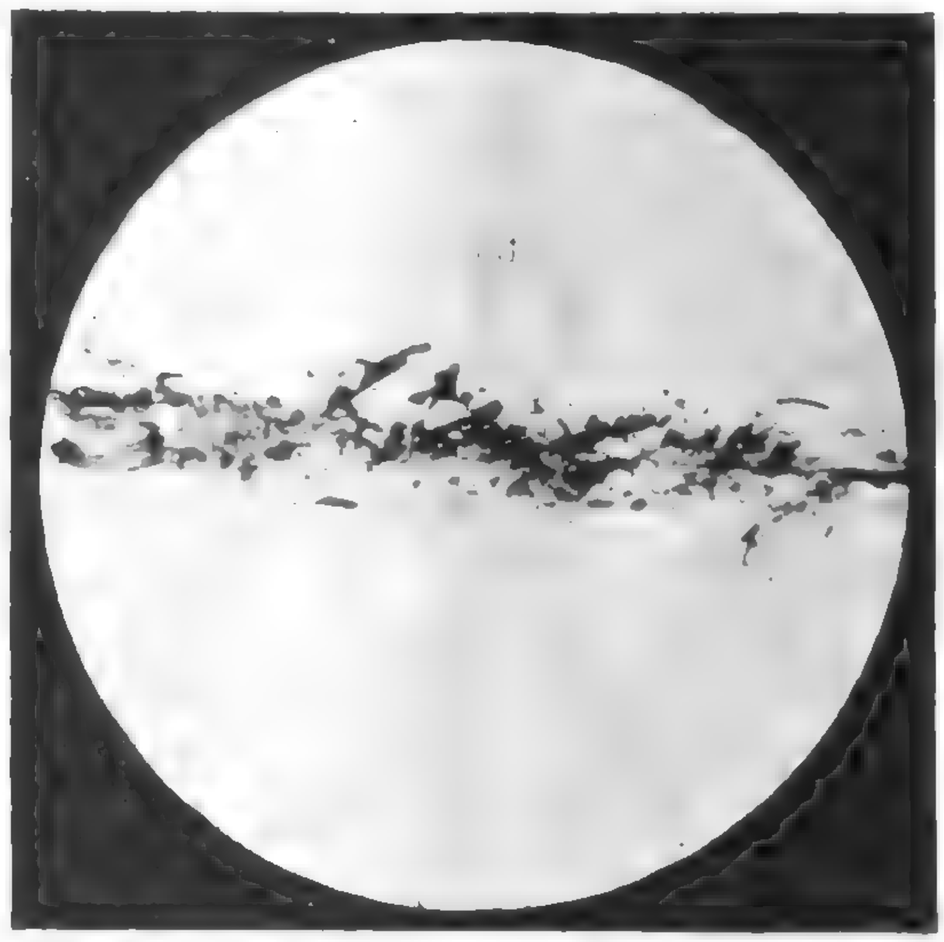


Fig. 23

Time will not permit of any further consideration of the interesting principles underlying the actual abrasion and polishing of the glass as it is desirable to consider now some of the mechanical principles underlying the design of the machinery.

Flat surfaces are formed by working them upon a flat tool. In the case of the grinding and smoothing operations the tool may be of cast iron and and the abrasive material emery or carborundum. For the operation of polishing, the tool may be covered with a layer of

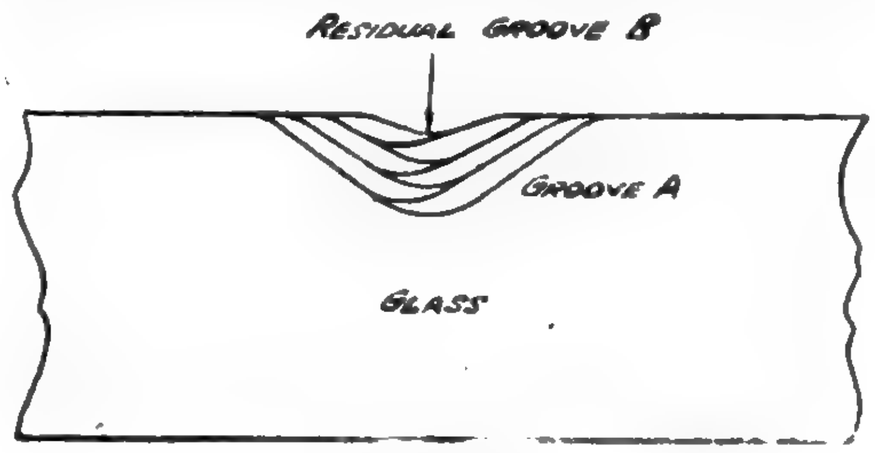


Fig. 24

paper, cloth, wax or pitch and a polishing medium such as wet rouge with water alone in the final stages.

For convex surfaces the tool is correspondingly concave, and, conversely, for concave surfaces a convex tool is employed.

As the final shape of the surface is deter-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THIS IS RATHER GOOD
READ IT

Life in a wholesale optical house is one everlasting rush and one has little time for meditation, but the passing of the old year brings us for a moment to a reminiscent mood to recall the happenings of the year now closing.

Trade conditions of the past year have dealt a severe blow to many; some have jogged along; others have made fortunes. We are not in the last category but, thanks to the support of our now many friends, this past twelve months sees us just a little further forward than we were.

The "Key Industries" Bill and the new tax on imported lenses is proving of great assistance to our block lens dept. We did begin to wonder whether lens manufacturing in England was worth while, and thought of using imported lenses entirely for our presc. work as many do, but we "stuck to our guns" and our big lens blocks now go round more merrily than ever.

The experience which English lens manufacturers have gained has helped considerably to improve the quality of the British article, but the inborn idea that a lens must be foreign to be good has still to be lived down. Meanwhile we keep persevering and pegging away and are confident of creating more friends and greater faith in W.O.W. quality and service during the coming year.

Here's our very sincere and best wishes to our friends in the wholesale and retail for prosperity and success in the New Year.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY:
DUDDEN HILL LANE,
WILLESDEN, N.W. 10

G. R.

By Direction of the

DISPOSAL AND LIQUIDATION COMMISSION

through the agency of the Joint Council of the Order of St. John of Jerusalem and the British Red Cross Society.

SURPLUS MEDICAL STORES FOR SALE by Tender.

Offers are invited for the purchase of these stores as a whole or by sections as detailed below. The main stocks are concentrated at C.S.D. Depot No. 5, Wood Lane, Shepherd's Bush, London, W.12, where they will be open to inspection from 16th December to 31st December 1921 inclusive, from 10 a.m. to 12 noon and from 2 p.m. to 4 p.m. (Saturdays to 10 a.m. to 12 noon). The Stores which are in sections as under have been listed and offers should be made for the whole of the items listed in one or more of these sections:—

SECTION 1.a. SURGICAL INSTRUMENTS, STERILISERS etc.
„ 1.b. DENTAL APPARATUS, APPLIANCES & MATERIALS
„ 11.a. X.RAY and ELECTRO-MEDICAL APPARATUS.
„ 11.b. CHEMICAL. BACTERIOLOGICAL and PATHOLOGICAL APPARATUS.
„ 111.a. ASEPTIC FURNITURE.
„ 111.b. SURGICAL APPLIANCES and SUNDRIES.
„ 111.c. RUBBER AND WATER PROOF GOODS.
„ IV.a. MEDICINES AND MEDICAL MATERIAL.
„ IV.b. TABLETS AND PILLS.
„ V. OPTICAL APPARATUS, SPECTACLES, LENSES, &c

Applications for permits to view should be addressed to:—

RED CROSS MANAGER, C.S.D. No. 5, Wood Lane Shepherd's Bush, London, W.12

Copies of the Shedules of Stock concerned may be obtained at the Depot by intending purchasers. All offers to purchase must reach the Red Cross Manager at the Depot before 10 o'clock a.m. on 16th January, 1922. The Disposal and Liquidation Commission do not bind themselves to accept the highest or any tender.

BEST WISHES

for a

VERY HAPPY

Xmas

to all our friends.

ELLIOTT OPTICAL COMPANY,
104 and 105,
Gt. Saffron Hill, E.C.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

OPTICAL MANUFACTURERS LTD.,

(Incorporating Wheway Optical Co., Ltd.)

WAR TIME CONTRACTORS TO THE ARMY SPECTACLE DEPOT.

Manufacture for the Wholesale Trade:—

Gold and Gold Filled Spectacle and Astig Frames.

Gold and Gold Filled Rimless Spectacle and Finger Piece Mountings

Gold and Gold Filled Monocles and Reading Glasses.

Solid Nickel Spectacle and Astig Frames.

Solid Nickel Pillar Frames and Folding Gauze Spectacles.

Steel Spectacle Frames.

Spectacle Sides and Jobbing Materials, in all Metals.

Extract from a letter received by a large Wholesale House:

"We have sold Wheways spectacles for a long time now, and as they have given us such all round satisfaction we have every confidence in them and desire to stock all their products where possible."

All these Articles are of English Manufacture

Works at VYSE STREET and GEM BUILDINGS, HOCKLEY HILL, BIRMINGHAM.

London Office: 55, HATTON GARDEN, E.C.1.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

mined by the shape of the tool, it is necessary for flat work to have working tools that are themselves optically flat. By the adoption of the very ingenious principle commonly attributed to Sir Joseph Whitworth and illustrated in fig. 25, it is possible to obtain surfaces that are optically flat.

Although this method is attributed to Sir Joseph Whitworth, there is reason to believe that it was actually used by the early opticians, although the beautiful underlying principles may not have been realised and were not expressed in words until the time of Sir Joseph Whitworth.

Three tools are necessary. Suppose, as indicated in position A, tool 1 is slightly convex, and tool 2 is concave. If these tools are worked together, their curvatures will become equal. If now tool 1 is worked in conjunction with tool 3, as indicated in position B, the final result will be that tool 3 will



Fig. 25

be ground concave in conformity with the convex curvature of tool 1, although the curvature will probably be less than in position A. If now the two concave tools 2 and 3 are ground together, as indicated in position C, the final result will be that both tools will become flatter, as indicated by the form of tool 2 in position D. By repeating the cycle of operations, that is, grinding 1 and 2, 1 and 3, and 2 and 3, it is possible to work all three tools optically flat.

It is unfortunate that there is no similar theoretically true method of working convex and concave tools. The method commonly adopted is to cut from sheet metal a convex and correspondingly concave gauge of the appropriate curvature; to turn out on a lathe a concave tool and a corresponding convex tool which will fit the respective gauges; to grind the convex and concave tools together until they are of the same curvature. It is fortunate that in grinding pairs of tools together they tend towards the truly spherical form. After grinding, the curvatures of the tools are examined by means of a spherometer or other appliance, and if the radius of the convex tool, say, is too small, the crown must be scraped or even filed so as to make the tool flatter, and in the same way the peripheral zones of the concave tool may be similarly scraped or filed. The two tools are then worked together so as to make them both equally spherical. The process is repeated until the desired radius is obtained.

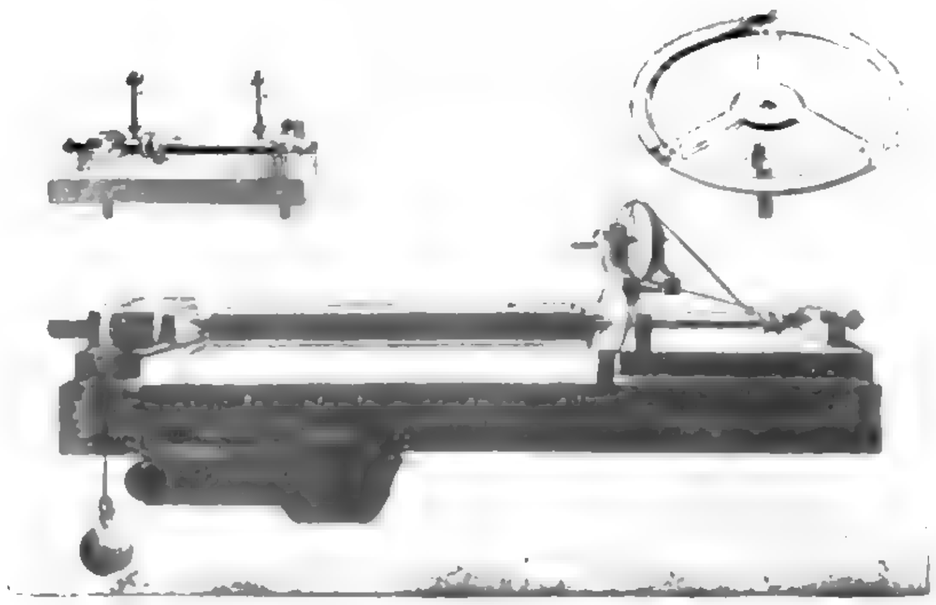


Fig. 26

This method of working curved tools was used by the early opticians several hundred years ago.

Fig. 26, for example, shows the lathe used by Father Cherubin 250 years ago. At the right end of the machine there will be observed the headstock upon the end of which is mounted the tool which is to be turned concave; the headstock is rotated by means of a wheel and crank. At the left end of the machine there is situated the tailstock against which the pointed end of the radius bar is held by means of a weight. At the headstock end of the radius bar there is mounted the cutting tool. By means of the tailstock screw the radius bar can be fed forward and as the radius bar is moved sideways about the tailstock pivot it is evident that the rotating cast



Fig. 27

iron tool or disc will be turned to a surface radius equal to that of the radius bar.

The corresponding machine used by Father Cherubin for the turning of convex tools is illustrated in fig. 27. It will be observed that

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

the tailstock is now situated on the opposite side of the cast iron tool to be turned. The principle of the machine is, however, the same.

Just as at the present day, the early opticians made use of both hand and machine methods. There are very few modern fac-

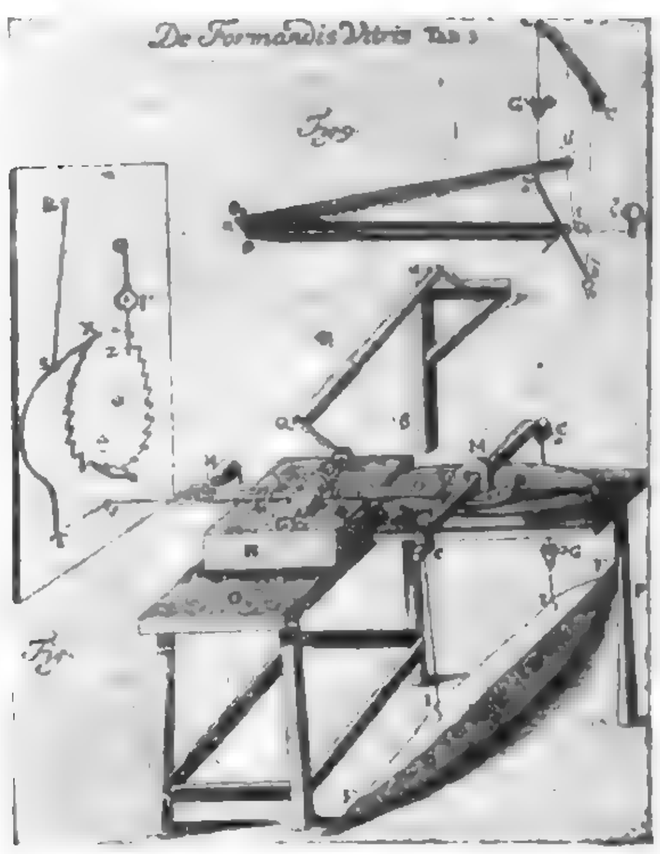


Fig. 28

tories which do not find it necessary to make some use of hand methods, although the endeavour must always be made to substitute machine methods.

An early example of the polishing machine used by Huyghens and described in his "Opera Relique" is illustrated in fig. 28. This machine was used by Huyghens 200 years ago.

The surface A to be polished is lightly clamped upon the table by means of a wedge at the front. Upon the surface lies the polisher B to which a load can be applied by the pressure of the foot on the board D which is connected by the cords I to the ends of a saddle bar C which passes through a hole M of the polisher holder. Reciprocating motion in a fore and aft direction is communicated to the polisher B through the sliding bar H the ends of which are connected by straps with a cylinder K upon which the inner ends of the straps are oppositely wound. This cylinder K is rotated by means of the crank Q. The block H with all its associated mechanism can be traversed sidewise upon the table O so as make the polisher B operate over different parts of the surface A and it will be observed that as the outer bearing is fixed, the handle Q is made telescopic to permit of this sidewise motion. By shifting the position of the foot upon the treadle D the load can be made to act always upon the centre of the polisher.

The mechanism at the rear of the machine is a device for indicating the number of strokes which suggests that Huyghens' smoothing and polishing operations were conducted upon a definite system.

From the engineering point of view it is interesting to note that the method of connecting the cylinder K with the reciprocating slide H is at the present day an important feature of a well-known bevel gear cutting machine.

The mechanism at the top shows an alternative arrangement of applying pressure to the saddle bar of the polishing tool by means of a spring device instead of the foot.

Although it is perhaps unwise to criticise the methods of these early masters, it is difficult to understand how Huyghens, except by the exercise of great skill, was able to obtain an optically flat surface when using the type of motion indicated.

Father Cherubin, as will be evident from fig. 29, clearly realised the importance of avoiding a repetition of the cycle of movements and of making the polisher pass over every part of the surface in succession. Father Cherubin's arrangement is open to criticism in so far as the path is of too symmetrical an order. To obtain good figure, such as we understand it to-day, with such a cycle must have been difficult. The tools used by Father Cherubin, as represented on the same slide, are an indication of the high development of the optical art 250 years ago.

Lord Rosse, in the construction of his large telescopic parts, was faced with the difficulty of obtaining good figure. The machine illustrated in fig. 30, which was invented and

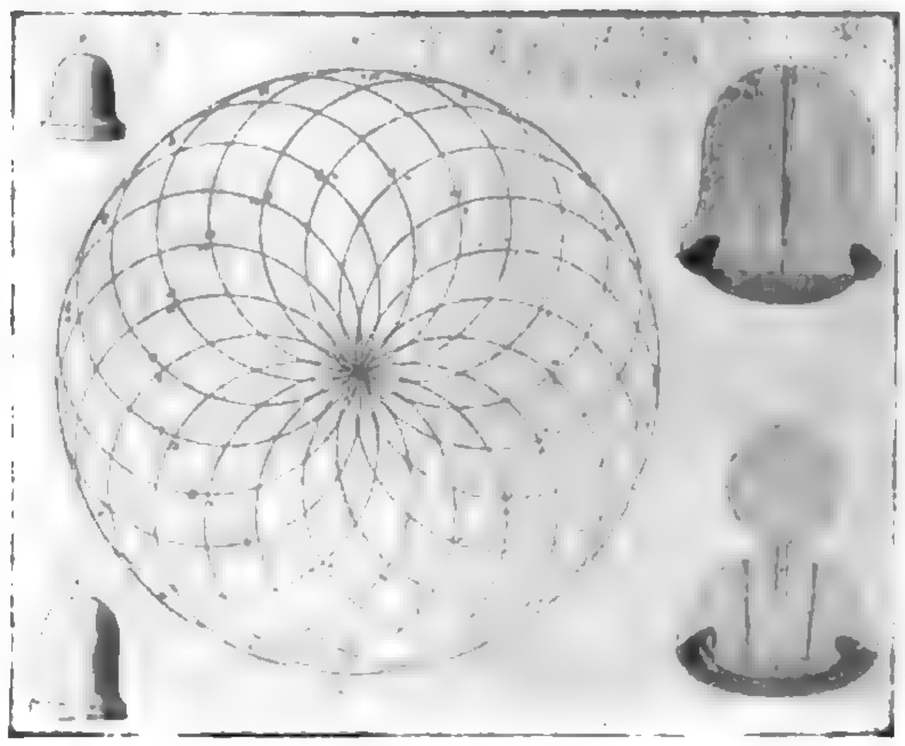


Fig. 29

used by him, is worthy of particular attention, as it embodies the essential characteristics of

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

W.H.T.

W. H. T.

Wishes all His Friends at

Home and Abroad

A HAPPY CHRISTMAS

and

A PROSPEROUS NEW YEAR.

WALTER H. THOMPSON

66 HATTON GARDEN, LONDON, E.C. 1.

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

DUPAUL, YOUNG OPTICAL CO.,

SOUTHBRIDGE, MASS., U.S.A.

The "ONLIWON" GOLD FILLED INNER RIM ZYLO FRAME.



WE claim we have the ONLY ONE of this class of frame that is scientifically and mechanically perfect in construction.

The most important feature of the "ONLIWON" FRAME is, the way the outer Zylo rim is drawn and closed over the gold filled inner metal rim by a mechanical process known as "crimping," which means curling, turning, drawing. pressing, squeezing. Burnishing one over the other by heat and pressure, thus firmly clamping it securely to the now imbedded inner metal rim, without screws, rivets or clamps.

"ONLIWON" Frames can be formed to any desired shape of eye without the two rims separating.

"ONLIWON" Frames have thin, inconspicuous rims and are not clumsy or showy.

All our Bridges have a Rounded Base at Shank.

Which absolutely prevents the Breaking or cracking of the gold shell of the filled metal during the process of shaping them to size, which is distinctly a Dupaul, Young Optical Company feature on all our frames.

The special KANTFEEL TEMPLES used on "ONLIWON" FRAMES are so made as to almost totally eliminate their breaking at the end-piece.

To be obtained from all Wholesale Optical Houses.

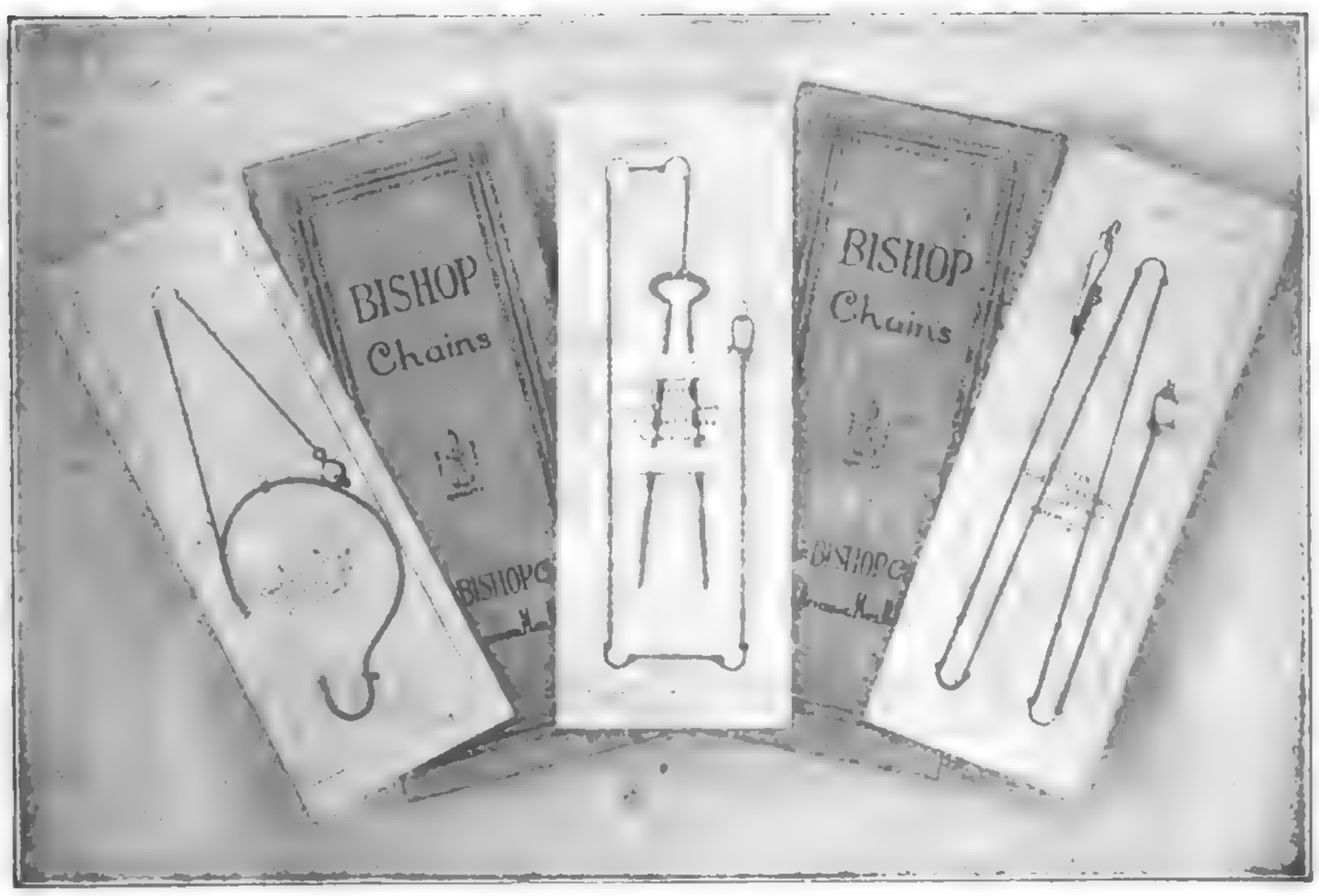
LONDON OFFICE: S. PULZER, 9. HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE BISHOP CO., INC.,
NORTH ATTLEBORO, MASS., U.S.A.



EYEGLASS CHAINS

In Gold and Gold Filled

GUARANTEED QUALITY, BEST WORKMANSHIP,
PERFECT COLOUR, SOLDERED LINKS.

ALSO

SILK EYEGLASS & MONOCLE RIBBONS

With Gold Filled snap and slide, look well, wear well and will appeal to your most discriminating Trade as a Quality item to stock.

Made in a large variety of styles and widths of fine grade silk.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

the present day machines so commonly used in this country as well as in Germany. Lord Rosse's principal object was to ensure that the path of the tool K L on the surface of the block H I to be worked should not repeat itself during a very large number of strokes and for this reason the motion of the tool was controlled by two cranks, the eccentricities and phases of which could be varied to suit the requirements. To the tool K L there was connected a bar D G which passed through a fixed guide D at the left end and was operated by a crank at the other end G. The rotation of the crank caused the bar to oscillate about the slot D as a centre and thus to oscillate the tool K L across the surface of the block H I, the amount of the oscillation being varied by altering the throw of the crank. The bar D G was connected at its end D through the intermediary of a connecting rod C to a variable crank E, the rotation of which moved the rod D G longitudinally and with it the tool K L. Thus to the tool K L there was imparted an oscillatory movement about the slot D and simultaneously a longitudinal movement.

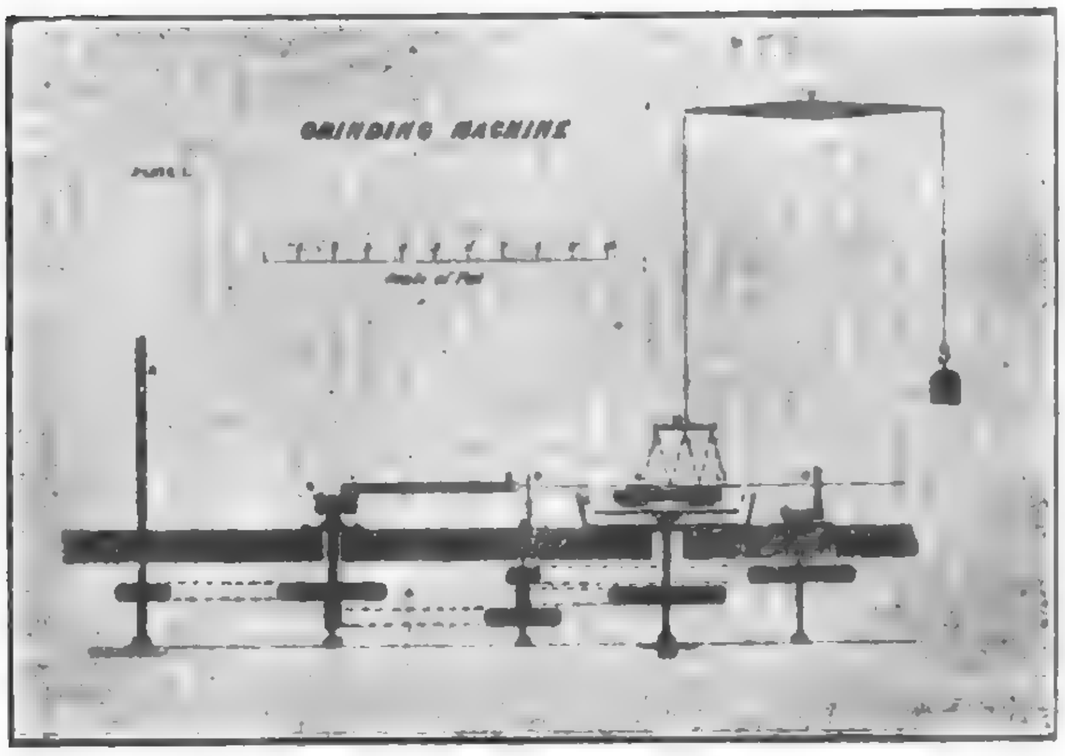


Fig. 30

[To be continued.]

The Proposed Optical Panel.

Suggestions of the National Insurance Beneficent Society and Home Counties Benevolent Association.

With reference to the comments of Mr. Herbert Smith in last week's issue, as to the above mentioned proposals for rates of payment to opticians under the National Health Insurance Scheme, several correspondents who have not received the circular letter referred to by Mr. Smith, ask us to publish the full text. We do so below, numbering the paragraphs for convenience of reference.

To the Opticians of the United Kingdom.
Gentlemen,

(1). On 1st July last (*vide The Optician*, No. 1583, Ed.), we addressed a letter to a number of opticians throughout the country informing them that the provision of optical treatment and appliances had become, as from July 4th, 1921, an additional benefit available to those persons insured under the National Health Insurance Act who were members of certain Approved Societies which had determined to set aside a portion of their surplus funds for that purpose.

(2). As the N.I.B.S. acts for some 60 Approved Societies we offered, in the letter before referred to, certain flat rate inclusive terms for the testing of sight and the supply of glasses.

(3). We were subsequently informed by the Council of the I.O.O. that the minimum profit upon cost for which an optician worked, was 300 per cent., and that as our scale only allowed a profit of 50 per cent. they should advise their members not to entertain our proposal.

(4). Nevertheless, about 200 opticians accepted our invitation to form a panel for the giving of optical treatment on the terms offered. We may add that in London and other large centres of population, we were able to command a first-class service at even lower rates than were offered by us in our previous letter. Our flat rate was designed to give to the individual practitioner in the provinces a larger "turn" than was apparently required by big firms in urban centres.

(5). We were afterwards approached by Mr. A. Hershberg, F.S.M.C., F.I.O., and other gentlemen representing the National Association of Opticians, and, in the course of discussion, a tentative proposal was made by them for our consideration of a fee of 5s. for the professional service to be rendered by the optician to the patient (including sight-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

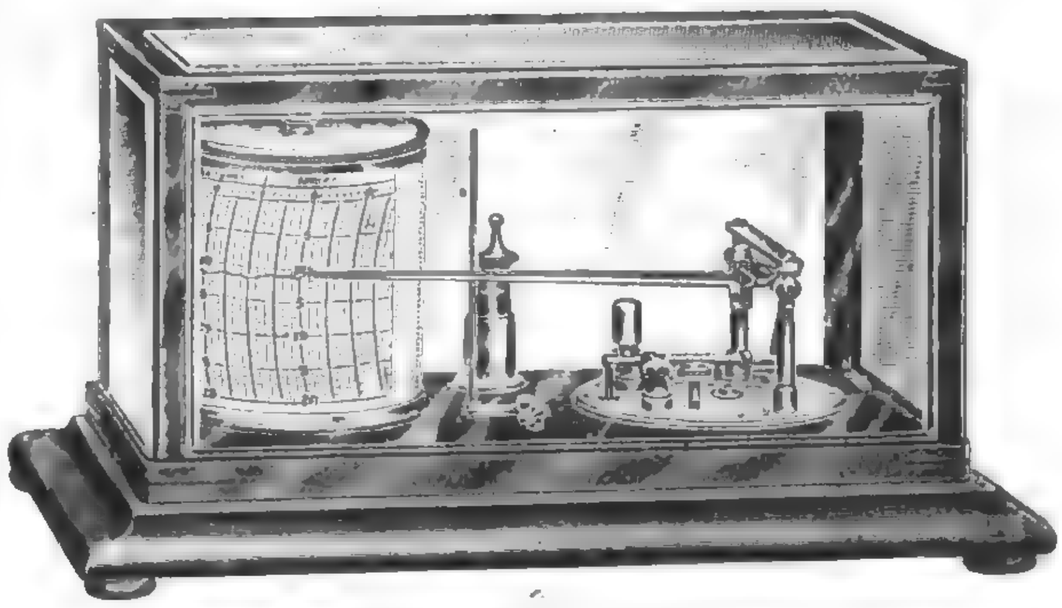
A POPULAR BAROGRAPH

of S. & M. Quality.

This first-class Recording Barometer combines an unusually high degree of accuracy with very moderate price. The Vacuum movement is concealed beneath the base plate, the whole construction being typically "S. & M." in quality and reliability. Available for prompt delivery, either in oak or mahogany case with glass cover, eight day clock and one year's supply of ink and charts.

The world-wide reputation of "S. & M." Scientific Instruments entails no penalty to the Retailer. Every sale shows a handsome profit.

Write for full particulars, terms and general booklet.



S. & M. No. 2318.

SHORT & MASON, Ltd., Aneroid Works, Walthamstow, London, E.17

LEVER BROTHERS

wish to extend to their clients
and many friends
their best wishes for a very

MERRY CHRISTMAS
and a
Bright and Prosperous New Year.

LEVER BROTHERS, *Wholesale & Manufacturing Opticians,*
18, Hatton Garden, London, E.C.
THE HOUSE THAT EXECUTES Rx WORK WITHIN 24 HOURS.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Two Best Sellers of the Optical World.

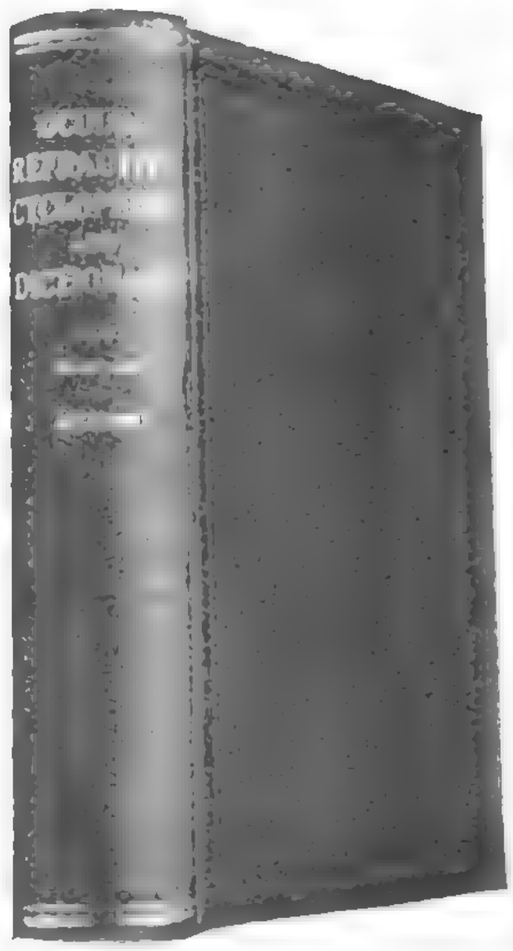
Oculo-Refractive Cyclopedia and Dictionary

A Ready Reference Book for the Refractionist--gives all Terms used by the Profession, their Definitions, Derivations
—Liberally Illustrated—

A WHOLE LIBRARY IN ONE VOLUME.

Used by leading Ophthalmologists and Optometrists as well as by Students. Simple in Style, Comprehensive in Detail. Includes Theory of Accommodation, Color-Blindness, Light, Optics: Practice of Blood Pressure Tests, Ophthalmology, Ophthalmoscopy, Refraction, Retinoscopy. The Answer to Every Question the Practical Refractionist may ask. Should always be at your Elbow.

Price $5,00



By THOS. G. ATKINSON, M.D., B.Sc.



By W. W. MERRITT.

OPTICAL SHOP PRACTICE

The Book of Practical Mechanical Optics which Tells Everything about Lens Grinding from A to Z. So clearly written that the Novice can understand it.

Price $2.00.

WANTED—Representatives to handle these Books throughout Great Britain.

THE PROFESSIONAL PRESS, Inc.

17, No. Wabash Ave. Chicago, Ill, U.S.A.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

test and fitting), in addition to the actual cost of the goods supplied, based on the list of certain well-known wholesale firms such as Fleming, Raphael, Lyon, Baird, Williamson, British Optical, etc.

(6). Whilst correspondence between ourselves and the National Association of Opticians was proceeding in regard to their proposal, we were approached by Mr. J. Harcombe Cuff, Secretary of the Institute of Ophthalmic Opticians, and, as a result of certain interviews, a memorandum was prepared, initialled by Mr. Cuff and handed to us. This memorandum is intituled, "Points agreed upon at a Conference held 2nd November, 1921," between Mr. Canter representing the N.I.B.S., Mr. J. H. Sutcliffe, representing the B.O.A., and Mr. J. H. Cuff representing the I.O.O," Clause 4 thereof reads as follows:—

(7). "The N.I.B.S. will pay a fee of 5s. for each person sent and (where glasses are supplied) the price of the glasses. All glasses to be charged at the prices set out in a Standard Prescription List to be agreed upon by the N.I.B.S.," etc.

(8). It was understood that this memorandum would be submitted by Mr. Cuff to certain other persons for endorsement by them and, incidentally, it was sought by Mr. Cuff to prevent any other opticians than those who were members of his particular organisation, or who held diplomas of the B.O.A. and S.M.C., from participating in the business.

(9). The fact that two organisations composed of opticians had made overtures to us on practically the same basis as regards the charges to be made for the work to be done, is reasonable evidence that the suggested scale (5s. on top of cost) was fair to the optician.

(10). A few days after the memorandum referred to had been initialled by Mr. Cuff, and without further reference to us on the subject, there was issued to all Approved Societies a printed circular over the signatures of Mr. Cuff and Mr. Sutcliffe offering to do the business on a much *higher* scale of charges than that embodied in the memorandum provided that it was conducted only through their own particular members. In view of our intimate knowledge of the cost price of optical appliances, *we have advised Societies to refrain from entertaining this scale.*

(11). The action taken by Messrs. Cuff and Sutcliffe might, in certain events, render it incumbent upon us to disclose to Societies, and through them to their members (the general public), the difference between the "Optician's usual prices less 15 per cent.," which are to be charged to patients under their "schemes," and the actual cost of the article to the optician. Had the fairly reasonable proposals before set out been adhered to, we should have been prepared to treat our own knowledge on this head as confidential.

(12). As a matter of fact the "less 15 per cent." of Messrs. Cuff and Sutcliffe is no more and in some instances less than the discounts which, under schemes set on foot by the Teachers, the Friendly Societies, the Railways, the Civil Service, and the Bradford Provident Associations were available to members of the public from F.S.M.C.'s, etc., without the intervention of anyone. Thus, for years past, the members of Mr. Rockliff's own group of Societies have been able to obtain a discount of 25 per cent. when paying their accounts, on production (at the time of payment) of their trading ticket.

(13). Rather than that Approved Societies should be compelled to pay exorbitant fees, we would advise them—as they are entitled to do—to apply money set apart for optical benefit to the provision of dental or some other equally desirable benefit. Moreover, it is becoming increasingly clear to us that the Hospitals of the country would be glad to accept a small fee for the service rendered by their ophthalmic staff (including testing and prescribing) which they at present render gratis, and hospital rates for glasses supplied are, as is well-known, much lower than if obtained from an optician in the ordinary way. If, therefore, opticians are desirous that their business should become still more centred in the hands of institutions, they will refuse the terms herein offered on behalf of our societies.

(14). Those terms are identical with the proposals made to us by the Secretaries of the I.O.O. and the N.A.O., viz.:—(1) the cost price of the goods supplied as per the wholesale list (to be specified in the estimate submitted), plus a fee of 5s. for the professional service rendered by the optician, including sight-testing, measurement and fitting.

(15). Where a prescription is brought to the optician and a sight-test is not required from him, the fee for the professional service rendered by the optician in measuring and fitting is to be 2s. 6d.

(16). Where more than one pair of glasses is required and are ordered at the same time, the one 5s. (or 2s. 6d. as the case may be) is to cover the professional service rendered as regards both pairs.

(17). Alternatively (2), we will pay a fee of 5s. for the professional service rendered in giving a proper and adequate sight-test, tak-

Digitized by Google Original from THE OHIO STATE UNIVERSITY

ing measurements and issuing a written prescription, with eye-chart showing all necessary directions (including alignment of the optical centers and advice as to the most suitable mounting) from which, for example, a wholesale house would, in the ordinary course of its business, make up for an optician the article required. This alternative service falls apparently within the offer of Messrs. Cuff and Sutcliffe, for they say in their circular to Societies :—

(18. "Sight-testing (when required) a fee of 5s. . . . The fee for sight-testing to be paid whether glasses are required or not."

(19). This alternative may, therefore, appeal to members of the I.O.O. and holders of diplomas of the B.O.A. and S.M.C. *But we do not recommend it and strongly advise opticians to select No. 1.*

(20). On November 24th, at a Conference with ourselves, the terms set out under (1) above were accepted in writing, on behalf of the N.A.O., by its President (Mr. Hershberg) and its Hon. Secretary, Mr. E. Moevius, F.S.M.C.

(21). If you desire to have your name placed on our Optical Panel, we shall be glad if you will write us to that effect and state whether you prefer to act on the scale numbered (1) above, or on the alternative numbered (2); your full addresses and hours of business and particulars of your membership of the various optical organisations, diplomas, etc.

(22). The optical "letter" which will be brought to you by the patient will contain full instructions and they are accordingly not detailed here.

(23). Payment of accounts rendered is made immediately following the close of each month.

(24). This offer, it is needless to add, is being made to the *whole* of the optical profession.

(25). In conclusion, we may say that the N.I.B.S. has been granted (with the knowledge of the Ministry of Health) the license of the Board of Trade under the Act of 1908, and with reference to the "British Dental Journal" of 15th November, and the "National Insurance Gazette" of 19th November will show that we have concluded agreements with the British Dental Association, as well as with the Incorporated Dental Society, the British Hospitals Association, the Queen Victoria Nursing Institute and other bodies concerned in the provision of additional benefits in kind to the insured population.

We are, Gentlemen,

Your obedient Servants,

(*Signed*). G. W. CANTER, *Joint*
P. ROCKLIFF, *Secretaries.*

1, Wandsworth Road, London, S.W.8.

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full.

Re Visual Equivalence of Lenses.

Sir,—When a patient is tested for distant vision with a vertex trial case, the refractionist writes his prescription according to the vertex powers of the lenses he has found suitable. Any optician may fill this prescription and the client will enjoy the same vision as with the trial case lenses.

On the contrary, if the test is made for near vision, *either monocular or binocular*, the patient who has his prescription filled may be dissatisfied although his glasses are of the same vertex powers as those that were chosen. This is because for near work the glasses are not necessarily equivalent to the trial case lenses; they may put the conjugate focus of the retina inside or outside the working distance, assuming that the dynamic state is the same as during the test.

This lack of equivalence for near work had never been pointed out before my article of 10th December, 1920, but one month afterwards (21st January, 1921), Mr. Whitwell spontaneously acknowledged it as follows:

"Consideration of equation (3) shows the correctness of Mr. Mayer's contention, that in general two lenses are not equivalent both for infinitely distant and near objects."

Six months afterwards (22nd. July), Mr. William Swaine acknowledged the same as follows:

"The objection of Mr. Mayer is a consequence of the lens itself."

Seven months before, on 17th December, 1920, the same author had written in *The Optician*:

"E. Mayer (Paris) brings forward certain points which he alleges have been over-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

WISHING OUR NUMEROUS CUSTOMERS AND FRIENDS

A MERRY XMAS

and Prosperous New Year.

KIRK BROTHERS

WHOLESALE MANUFACTURING OPTICIANS

36, Gray's Inn Road, LONDON, W.C.1

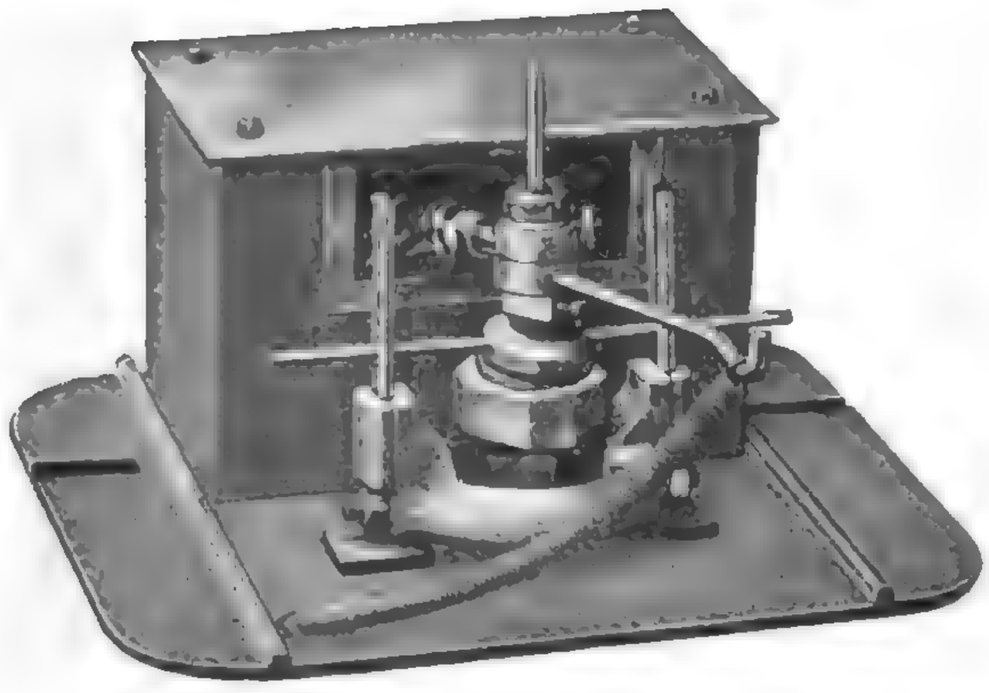
"SOMCO"

AUTO-SURFACING MACHINE.

PATENTED IN
GREAT BRITAIN
U.S.A.
FRANCE
GERMANY.

LONDON
MADE.

Ask for Quotations.



Requires Only 1/6 H.P.

TOOLS
GAUGES
SURFACING
SHOP
EQUIPMENT
OPTICAL
MACHINERY &
INSTRUMENT
REPAIRS.

SURGICAL & OPTICAL MFG., Co.,
22, Union Road,
Clapham, London, S.W. 4

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Pin your faith to L.O.C. for all your Rx Work and you will have frequent cause for self-congratulation.

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris, France.

Also at—2, Str-Barsei, Bucharest, Roumania.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

looked . . . that they have been overlooked is by no means the case. . . Vertex designation does not introduce any inconsistencies, rather it removes many difficulties."

The writer of this article cannot claim that his subsequent opinion above mentioned is a spontaneous one, for it is a consequence of another's contribution.

There is surely a "fundamental misunderstanding between us." Neither I nor anybody, save an ignoramus, could have denied that "to correct errors of presbyopia . . . different pairs of spectacles would be necessary." Besides, this question has nothing to do with equivalence between lenses of a vertex trial case and glasses delivered upon a prescription. As long as Mr. Swaine will mistake *accommodation* for equivalence, there can be no way of agreement between us.

True it is that the vertex system has some advantages for distant vision. I do not advocate the other system, but I think, as Mr. Swaine guessed it, that "the vertex system has not received full investigation."

Apart from spectacle lenses, the vertex system is totally ignored, and especially in *Instrument Design* where the only cardinal system can be made use of according to aberration theories and where magnification is a first-rate factor.

Mr. Swaine's dream is to get away with "any external system of correction, charts or tables." Unfortunately, such corrections are unavoidable to give correspondence of vertex powers for near work. Mr. Swaine acknowledged it himself as follows (*The Optician*, 22nd July, 1921):

> "The vertex numbering . . . reduces the number of steps necessary in the elucidation of tables of equivalent lenses for near work."

In the same article, he says that "equivalence for near work is equality of amplitude of accommodation." He promised to prove it later on. Now, as *accommodation* has nothing to do with *equivalence*, I wonder if he can ever fulfil his promise.

E. Mayer.
53, Rue d' Amsterdam, Paris.

Fees for Sight Testing.

Sir,—Undoubtedly one of the greatest evils in the optical "trade," and one that offers the greatest opposition to the legal recognition of the trade as a profession, is the prevalent different system of charging for "sight-testing" and goods supplied, and the manner in which they are presented to the public.

The methods used by some opticians are far from desirable from an honourable point of view, and are used by both qualified and unqualified men, who induce a likely client into the premises by marking goods by misleading methods, and among them "Sight-Testing Free" in combination with the display of an article of good value priced at less than it is possible to sell it with a profit; against the figure the useful word "From" as small as possible.

Another despicable method, the marking of a pair of spectacles glazed with sphericals at a definite price and then explaining to a would-be purchaser that the price only applies to sphericals of low power, or that the lens to suit the case has to be specially ground.

It has been argued the question of sight-testing as accepted, is not at present a "diagnosis" for which a fee is legally chargeable, and to "test the sight" becomes "personal service" required to sell goods that are most suitable; and needless to say this does not only apply to optics.

To the litigious there is the same opportunity for damages from a bad fitting boot measured and supplied by a salesman, equally as that of fitting wrong power lenses, when it is contended that the article supplied will remedy or cure a defect, or assist a cure of deformity or disease. A pharmacist to safeguard himself when a "cure or remedy" is implied to some preparation, is legally covered by the application of stamp duty. What humbug to state that the public insist to be "hoodwinked." It is the dishonourable methods in vogue to-day, that one sees advertised. "Must be first-class salesman," proving conclusively that "salesmanship" of a certain type is accepted as qualification.

Does it not seem deplorable that with the existing societies, there is no unity or harmony among opticians to-day, especially when it is realised what wonderful mutual benefits can be derived from the science of optics as applied to the modern needs of mankind.

Cannot the spirit of "Live and let live," be applied to a Statute affecting qualified and unqualified, so that the optician can claim an honourable status, and eradicate many evils prevalent in so noble a calling? In conclusion I would add, it is said that a profession is where both ends are made to meet by your wits; a trade where you are at wits' end to make both ends meet.

Sir, undoubtedly I shall be badly criticised, but hope to gain knowledge from others' experience and their views, and do not write with ill will or malicious intent.

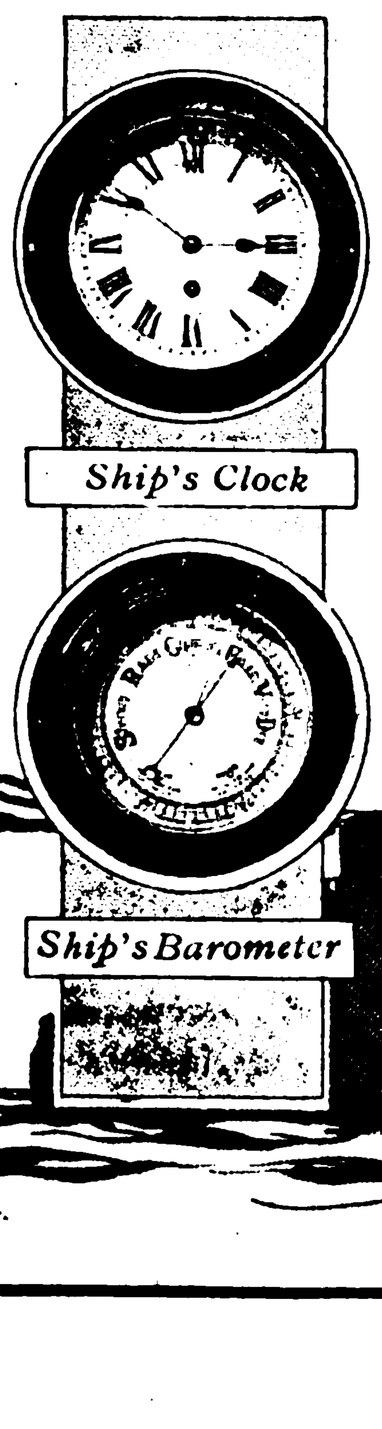
Standard.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

T. A. R. & Co.

"THE ALL BRITISH HOUSE."

Over 2,000 Designs in Aneroid Barometers.



Time and Tide
And Ship's Instruments



T.A.REYNOLDS & CO
40-1-2 PERCIVAL STREET,
LONDON E.C.1



Steam-pipe Thermometer

Hydrometer

Telegrams—
"THERBAROME. LONDON."

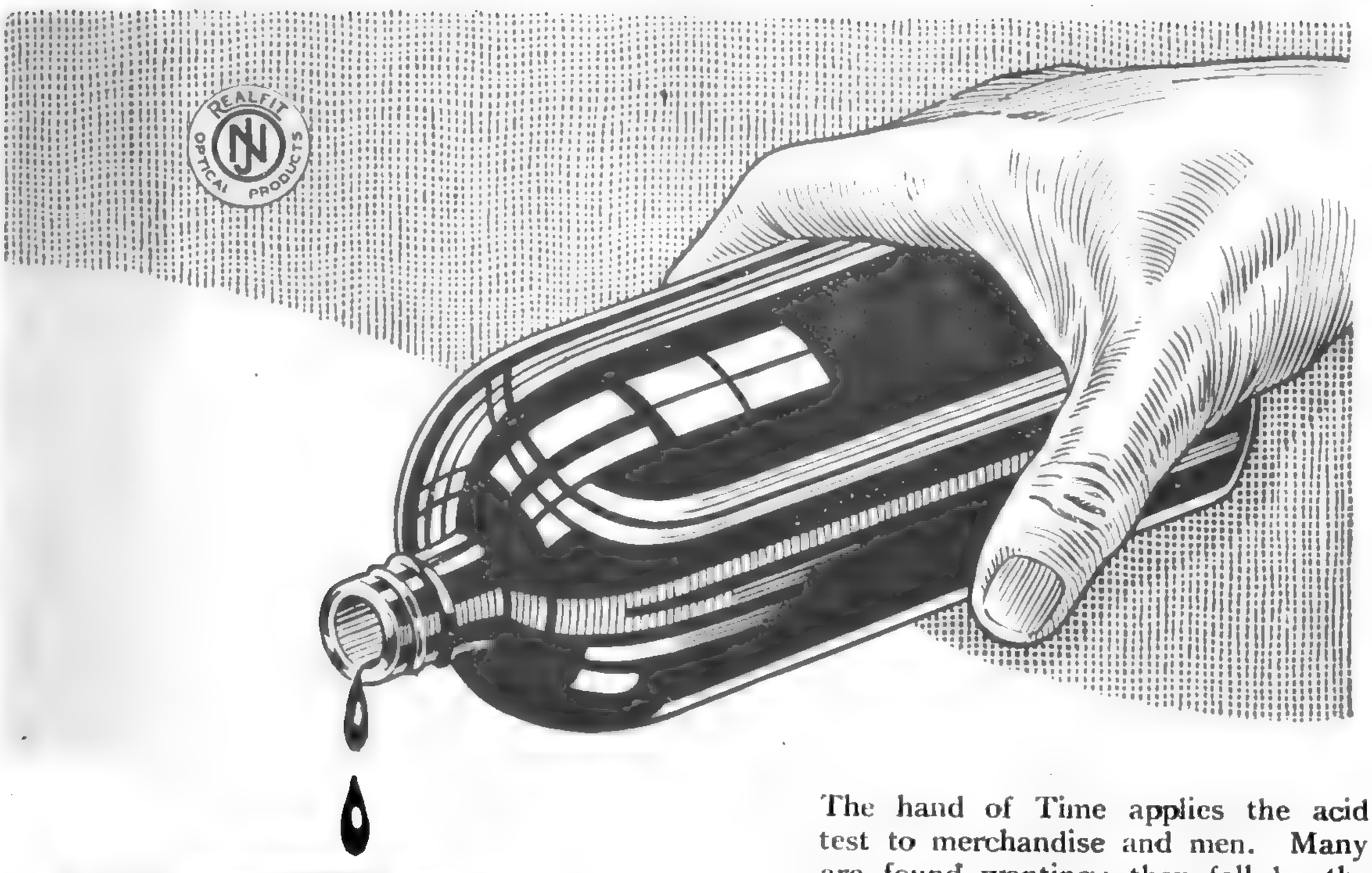
Telephone—
339 CITY.

Showrooms and Offices at above address.

If you are a Retailer and need ORIGINAL LINES in Barometers, Clocks and Thermometers, write us, and although we will not supply you direct, we will put you in touch with the Nearest Wholesale House.

WHOLESALE AND SHIPPING TRADE ONLY.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



The hand of Time applies the acid test to merchandise and men. Many are found wanting; they fall by the wayside. A few possess that element which men call QUALITY. Time cannot efface their greatness.

REALFIT Finger Piece Frames and Mountings are Quality products. Whether you buy to-day or next month, *always* you can be certain of their uniform high standard—of their comfort, beauty and enduring strength.

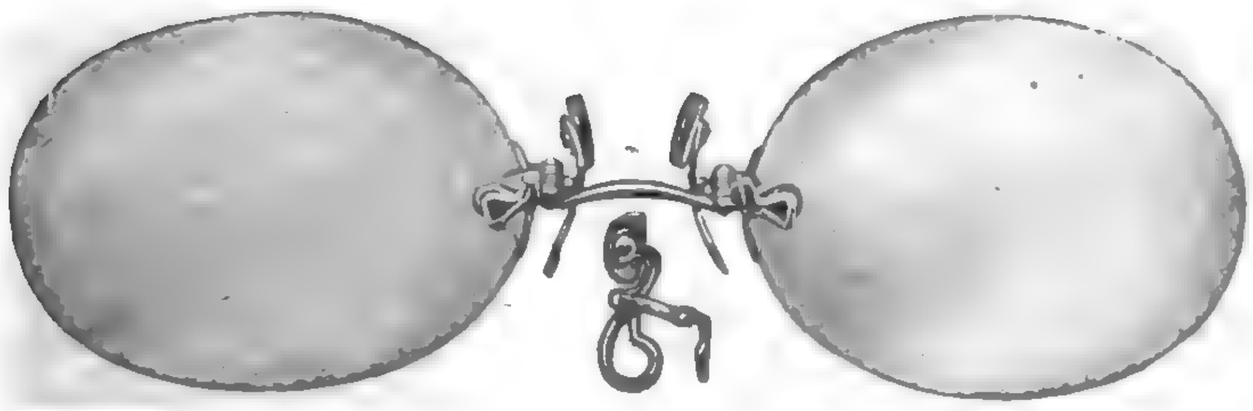
The best material is used throughout. Every part of the mounting is constructed with great precision.

No less than five inspections testify to the care exercised that no REALFIT should leave our factory unless it is absolutely perfect.



REALFIT

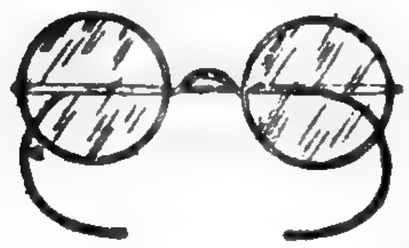
Finger Piece Mountings and Frames.



Made in all standard sizes with a complete assortment of Guards. If your Wholesaler cannot supply you, write us.

NEW JERSEY OPTICAL Co.,
Newark, N.J. . . . . U.S.A.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



OPTICAL BLOCKS

To illustrate all features of Optical Service. Write for Lists.

CHEMISTS' DESIGN SERVICE,
12, Humberstone Gate, LEICESTER.

PRESCRIPTION SPECIALISTS.

Midland Lens Co Ltd

ALSO UNCUTS. TORICS A SPECIALITY.
DALE STREET, COVENTRY.

PERCY S. DE SAULLES.

Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES
Micro Cover Glasses, Glass Cells and Cavity Slips, etc.

The Platts, Amblecote, Stourbridge.

REPAIRS

C. BAKER 244 HIGH HOLBORN LONDON

to all kinds of Scientific Apparatus carried out in our own Factory.

Estab. 1765 Work Returned Promptly. Charges Low

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
C. S. DYMOND, M.I.Mech.E., F.I.C.P.A

W. P. THOMPSON & CO.,
12, CHURCH STREET, LIVERPOOL.
Chartered Patent Agents.
H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and ABRONAUTICAL ANBROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
ESTABLISHED 1876 TELEPHONE CITY 419

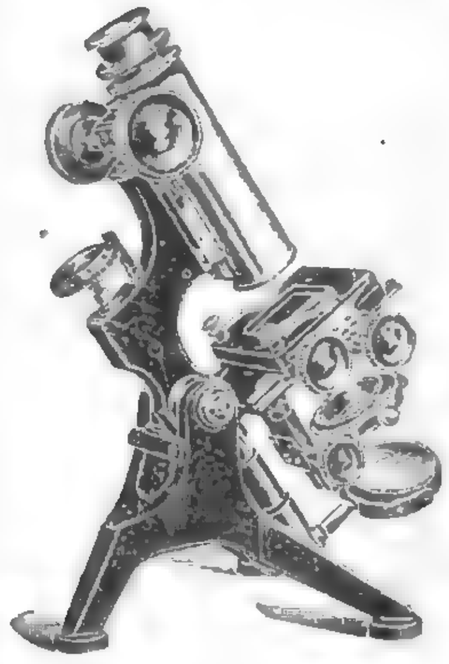
Worshipful Company of Spectaclemakers.

Tuition for the Company's Examinations in Optics and Sight Testing at
THE SCHOOL OF OPTICS Ltd.

2, GUILFORD PLACE, LONDON, W.C. 1
Particulars on application.

SELL WATSONS' BRITISH-MADE MICROSCOPES

NOW READY



New Catalogues:
Part 1—Students' Microscopes.
Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,
313, High Holborn, W.C. 1
Works: High Barnet, Herts. Established 1837.

F. BARKER & SON, LTD.
SUNDIAL HOUSE,
12, Clerkenwell Road, LONDON, E.C. 1
MANUFACTURERS OF ALL CLASSES OF
SCIENTIFIC AND OPTICAL GOODS.
MANUFACTURERS OF
Aneroid Barometers, Compasses, Drawing, Mining, Surveying & Scientific Instruments of Every Description.
Illustrated and Descriptive Catalogue Post Free to any part of the World. Illustrated Booklet upon Sundials, Barometers and Compasses, Post Free. LISTS FREE.
Correspondence Invited. Bankers' and Trade References.
CLINICAL THERMOMETERS A SPECIALITY

Registe LONDON Trade Mark Estab. 1848

The Optician's Handbook.
Price 4s. 0d. Post Free.
An elementary text book required by every student of Optics.
It is an introduction to "The Study of the Refraction of the Eye, its Anomalies and their Estimation and Correction by means of Glasses.

The Hatton Press, Ltd.,
125, Fleet Street, LONDON, E.C.4

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

A Mine of Sales Helps!

Every other month, in the interest of better retailing and better business, we issue a 32-page sales publication, which, from cover to cover, is just jammed full of sales helps, practical ideas and dividend-paying suggestions for the up-building of the retail optical establishment.

We call it the "SHUR-ON CHRONICLE." In truth it's the retailer's guide to better merchandising methods, bigger volume, more profits and—an invaluable consumer goodwill.

We would like to add your name (without obligation, of course) to the 10,000 other optical specialists who are now enjoying and profiting by this unique sales and goodwill builder. Sign and return the enclosed coupon.

Shur-on Optical Co.,

Rochester, N. Y.,

U.S.A.

Sign Here — Tear Off — Mail!

Without obligation on my part please send me the "Shur-on Chronicle" regularly as published.

Name .....

Street No. .....

City .....

County .....

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d. per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

AUSTRALIAN OPALS. Direct from Australia. Single stones or quantities. Beautiful colours. Lists free. Optical goods or scientific instruments in exchange. Correspondence invited. Seward, Optician, Melbourne, Australia.

FOR SALE. Half-plate stand camera, mahogany, 10" ext. Beck-Steinheil Unofocal Ser. 1., No. 5. f/6 with Beck Celverex shutter, T.B. to 1/80 sec., 3 mahogany double dark slides, stand, focusing cloth, waterproof case, the whole £3 10s. Also ¼-plate Holborn reflex, magazine 12, Ilex, R.R. f/77. T. and I to 1/100 sec. Leather case, £2. Please address, Box 3508, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

The Optical Society.

President: Mr. R. S. WHIPPLE, M.I.E.E.
Vice-Presidents: Prof. FREDERIC J. CHESHIRE, C.B.E., Director of the Technical Optics Department of the Imperial College of Science and Technology, South Kensington; Sir HERBERT JACKSON, K.B.E., F.R.S.
Hon. Treasurer: Mr. I. G. AITCHISON, B.A., LL.D.
Hon. Secs.: Mr. L. C. MARTIN, B. Sc., Imperial College of Science and Technology, South Kensington S.W.7 and
Papers' Secretary: Mr. F. F. BRYSON, M.A., B.Sc.

Scientific Instrument Makers.

MICROSCOPES of all kinds manufactured at our own works.
REPAIRS to Prismatic and other Binoculars etc., promptly executed.

H. H. SHARLAND (H. KEMP), 9 & 10, THAVIES INN, HOLBORN CIRCUS, LONDON, E.C. Tel.: Holborn 4840. Established 1860.

Every Description of Ophthalmic Supplies. All Requirements of the up-to-date Sight Testing Optician. Good Special Lines at keenly Competitive Prices.

MANY SUCCESSES IN THE EXAMINATIONS!
Your Opportunity to
QUALIFY IN OPTICS
PRACTICAL WORK. Students taking the Course may receive personal tuition in the practical work AT ANY TIME DURING THE COURSE.
Expert Tuition by Correspondence for the SIGHT-TESTING DIPLOMAS of the Worshipful Company of Spectacle Makers (F.S.M.C.), or the British Optical Association (D.B.O.A.).
Write for full particulars—
C. A. SCURR, M.P.S., F.S.M.C., F.I.O., etc.
64, High Street - - - - BARNET.

TURNERY WORK IN EBONITE
Small turnery work of all kinds undertaken. Rod and Sheet supplied in any quantity, cut to order. Enquiries Solicited.
BURGE, WARREN & RIDGLEY LTD.
91 & 92, GT. SAFFRON HILL, LONDON, E.C.1

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.
STERLING ACCEPTED AT PAR.
COMMERCIAL OPTICAL Co.,
DANDURAND BLDG., MONTREAL.
Cable "Optical" A.B.C. Code 5th. Edition.

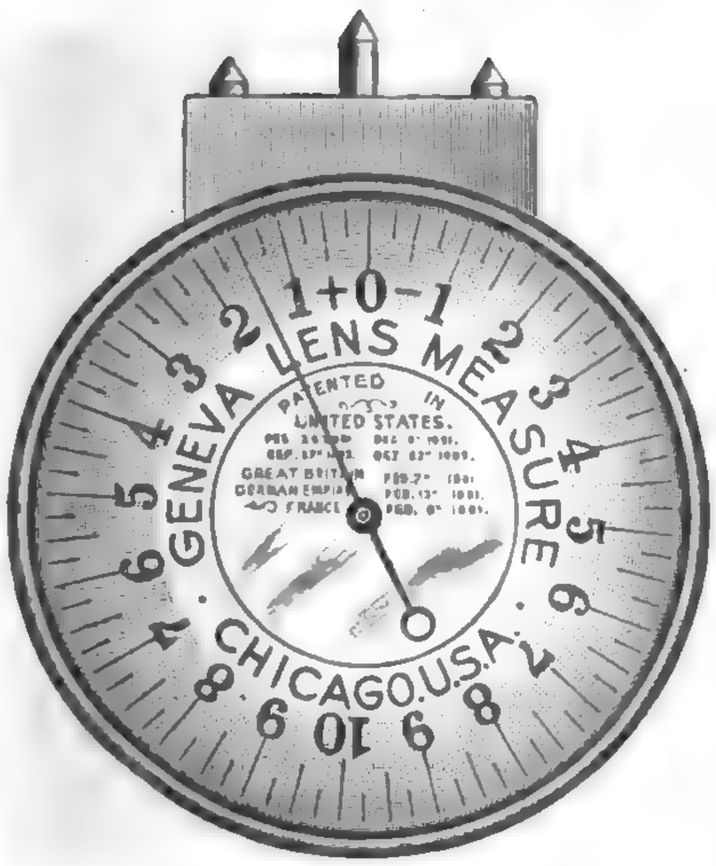
Telephone JAMES B. SLY, Central 10200.
9 & 10, EDWARD ST., WARDOUR ST. LONDON, W. 1
To S.M.C., B.O.A. & I.O.O. DIPLOMA HOLDERS
Oak frames and modelled gold Arms for the diplomas The Arms of the S.M.C., City of London, and devices of the I.O.O., B.O.A. and Ph. Society in water colours, and framed dark oak, with descriptive engraved plate affixed, 27/6 each. Packed and put on rail.
Printed & Embossed Optical Stationery.
Steel Dies for use of Diploma Holders.
Electros of Coat of Arms & Optical Devices.
Engraved Seals, Prescription Forms, Signs, etc.
Price List on application.
Electro No. 12 Price 3/6

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



TRIAL CASES in a Variety of Styles

Best Finish



LENS MEASURES.

Retinoscopes, Ophthalmascopes, Corneascopes, etc., etc.

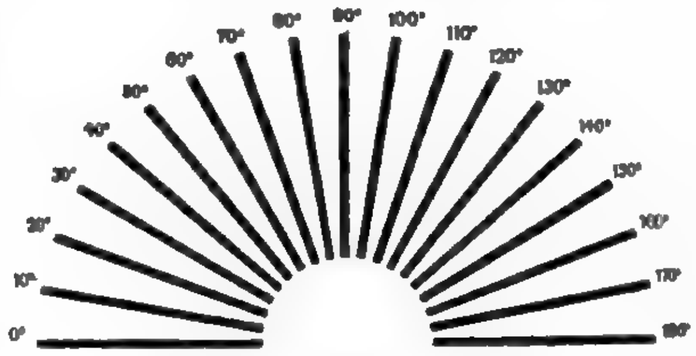
All kinds of Sight-Testing Requisites.

Immediate Delivery from Stock.

Prices Moderate.

SPECIALITIES.

The 'Optrex' Lens Finder
The 'Optrex'
Face Measuring Rule.
The 'Optrex' Axis Finder
TIME SAVERS.



D-24
E D B
D-18
O N P Z
D-12
R C P B D
D-9
N S R E F P
D-6
H O C L Z N E
D-4.5
P F T D E O Z L
D-3
L V A T E V P N

Large variety of Test Cards for Distance or Reading.

Special Folding Carrying Cards

JOHN BAIRD,
Manufacturing Optician,
Telegrams: "SPECTACLES, GLASGOW."

"HERALD" OPTICAL WORKS,
68 & 70, MITCHELL ST., GLASGOW.
Telephone: CENTRAL 541.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

A.—**Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

ENERGETIC and Pushing traveller wanted for town. Apply, in confidence, to London Optical Co., 344/54, Gray's Inn Road, W.C.1.

REFRACTIONIST Wanted temporarily from February 1st next. Write Box 5793, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED Optician wanted to manage a West End Department, a young man with general knowledge of up-to-date testing and one who thoroughly understands all optical and scientific instruments. Apply, stating age, experience, and full particulars to Box 5796, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, forewoman for thermometer dividing and etching, also one or two improvers. Apply, T. A. Reynolds, Son & Co., 40-42, Percival Street, Goswell Road, E.C.1.

WANTED for Glasgow, for first-class establishment, sight-testing optician. Must be reliable, good tester and frame fitter, and quick. Apply, with testimonials and state salary to Box 5795, c/o "The Optician," 125, Fleet Street, E.C.4.

MICROSCOPE Department. Smart assistant required with good knowledge of microscopes and accessory apparatus. State age, experience and salary required. C. Baker, 244, High Holborn, W.C.1.

A RELIABLE Optician required for travelling. Must have good references. Box 5792, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT wanted with good general knowledge of optical instruments and sight-testing qualified preferred. State age, experience, salary required. London. Box 5791, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED by qualified optician, responsible position offering scope for accurate refraction, first-class salesmanship and energetic organising. In or near London. Box 5752, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED Refractionist (F.S.M.C.), keen and energetic, age 33, good address and appearance, desires engagement. Careful tester, with clinical experience, London or near preferred. Apply, Box 5766, c/o "The Optician," 125, Fleet Street, E.C.4.

RETAIL or Wholesale position in London required by unqualified refractionist, 9 years' experience, including management of general optical trade. Good appearance and address, thoroughly reliable in every way. Studying for S.M.C., only reason for seeking change. Box 5771, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION as branch manager or first assistant required in London or suburbs. Passed S.M.C. examination excepting one subject, careful refractionist O. & S. methods. Can do all repairs, also edging and fitting. Good all-round knowledge. own test case, etc. Box 5767, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED for abroad, experienced sight-testing optician, qualified preferred. Apply, Lawrence & Mayo, Ltd., 19, New Oxford Street, W.C.1.

YOUNG Lady, D.B.O.A., F.S.M.C., with general optical experience, desires a position in London, moderate remuneration. Box 5790, c/o "The Optician," 125, Fleet Street, E.C.4

ASSISTANT, Qualified, wanted for sight-testing, knowledge of workshop, age about 25, London district. Send full particulars of experience, salary required and photo to Box 5765, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUTH, 19, requires situation where further knowledge of optics could be obtained, has had three years' experience in Jeweller Opticians. Witham, 20, High Street, Abingdon.

LOCUM TENENS, retired, elderly, experienced, qualified sight-tester and practical rimless fitter, requires occasional employment, days, weeks or months, any time or distance. Apply, Box 5786, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., 21, requires position as first assistant. Fully experienced, and can take full charge. Box 5788, c/o "The Optician," 125, Fleet Street, E.C.4.

MECHANIC used to meteorological and general instrument work, hand-turning bench, finishing and lacquering. 18 years' experience, any distance, town or country. F. Orford, 83, Ashmore Road, Paddington, W.9.

JOBBER wanted to take charge of small workshop, with very good all-round experience. Reply, full particulars, wages. Benn Franks, 44, Saville Street, Hull.

QUALIFIED Opticians wish to recommend their first assistant. Good refractionist and salesman. First-class man for charge of prescription workshop. Box 5780, c/o "The Optician," 125, Fleet Street, E.C.4.

LADY desires post as clerk, 5 years' general office experience,, quick at figures, typing. Good references. Box 5778, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS rimless fitter and glazier, both bevel, shell and rimless, bifocal work, 11 years' experience, seek post. Box 5777, c/o "The Optician," 125, Fleet Street, E.C.4.

SITUATION required by good all-round man, well up in refraction and all repairs and rimless work. Also Kryptoks and cement bifocals. Able to take entire charge. Apply, Box 5781, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST, used to working class trade, good retinoscopist and salesman, 20 years' experience, open to engagement. Optician, 49, Hazlewood Avenue, Newcastle-on-Tyne.

REFRACTIONIST, young lady, age 25, thoroughly experienced in all branches of sight-testing, desires position as assistant to sight-testing optician. Used to sole charge. Midlands preferred. Box 5773, c/o "The Optician," 125, Fleet Street, E.C.4.

LOCUM TENENS disengaged, capable and experienced refractionist, thoroughly reliable and practical workman, used to management. Excellent credentials. Box 5774, c/o "The "Optician," 125, Fleet Street, E.C.4.

ASSISTANT requires progressive berth. Passed S.M.C. examinations except one subject. Good refractionist and salesman. Can do all repairs. In or near London preferred. Box 5779, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. London man of good address, over 15 years' experience, expert in sight-testing and fitting, smart salesman, at present managing branch, seeks change, similar capacity. South Coast or London preferred. Box 5784, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, age 19, requires position, good testimonials. Able to do all Rx work, repairs, and attend customers. Would be indispensable to retail optician doing own jobbing. J. Gasson, 52, Battersea Park Road, S.W.11.

ALL-ROUND Jobber, rimless fitter and V-edge, etc., seeks situation in Glasgow. Box 5783, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACER (all-round) seeks situation (male). Box 5764, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED Young lady required for prescription department. Box 5736, c/o "The Optician," 125, Fleet Street, E.C.4.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Are You Satisfied

that the abrasive you are now using gives you

The Best Possible Results?

If not, ask your wholesaler for trial samples of

"U.K." No. 4 and No. 5 Emeries and Rouge

You will be pleased with them and will require regular supplies. They are put up in tins of convenient size containing 5 lbs.

UNITED KINGDOM OPTICAL CO., LTD.,

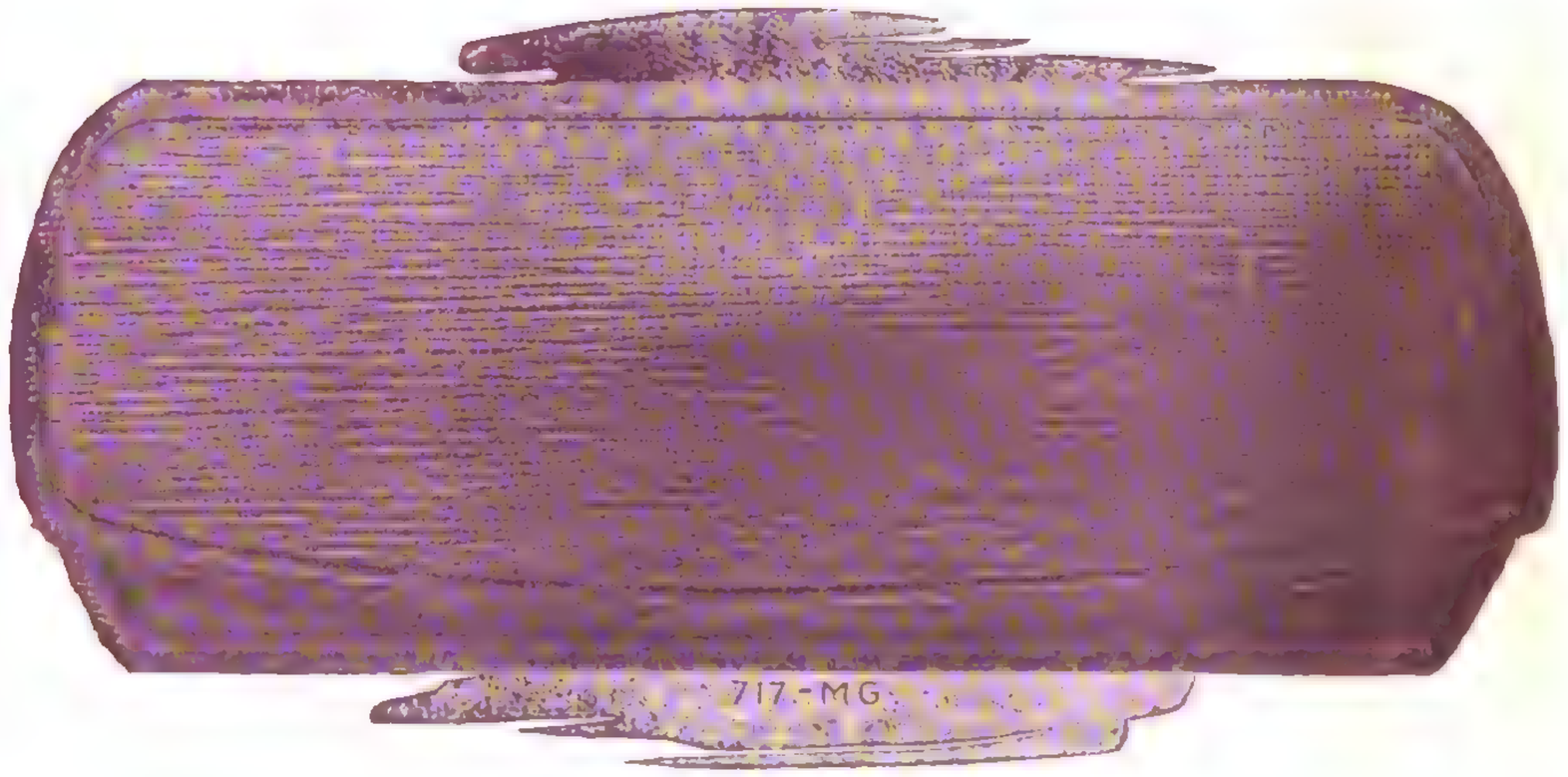
(Wholesale and Export Only.)

MILL HILL, LONDON, N.W.7

Digitized by Google Original from THE OHIO STATE UNIVERSITY

AMERICAN OPTICAL COMPANY, LIMITED

A Case of Color



Wellsworth Imitation Leather Cases

Supplied in MG Covering in Three Colors.

Green Blue Wine

At the Same Price as Black MG Cases.

Three beautiful colors to pick from. In addition to the usual Black MG covering on Wellsworth Imitation Leather Cases, you can secure either Green, Blue or Wine Cases, or an assortment of four colors, and at the same price as charged for plain black MG cases.

Wellsworth Imitation Leather Cases have tight snug-fitting covers that keep the dust out. Patented self-closing positive action spring is inconspicuous and noiseless. Heavy gauge steel cover strengthens case and means added lens protection. Covering and lining vulcanized to metal prevents rusting, finished with smooth fitting, high grade, fast color velvet and selected chamois. Properly covered edges wear well and long.

Ask your Jobber for Wellsworth Colored Imitation Cases.

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C., (Printed by The Century Press, Fulham), Dec. 23, 1921.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

The OPTICIAN
And SCIENTIFIC INSTRUMENT MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1605 FRIDAY, DEC. 30, 1921.

1922

GREETINGS TO OUR FRIENDS

"But I would see the Sun rise upon the glad New Year."—Tennyson.

We all hope for better times in 1922. COMMENCE well by purchasing

Wellsworth Optical Products.

AMERICAN OPTICAL COMPANY, Ltd.,

39, HATTON GARDEN, LONDON, E.C.1

Reg'd at the G.P.O. as a newspaper **PRICE 4d** *Subscription post free 12 months* **17s**

Postage in United Kingdom **1d**

Foreign Subscription including "Optical Almanac," post free **20s.** *yearly.* *The Hatton Press, Ltd., 123-5, Fleet St., London E*

Digitized by Google Original from THE OHIO STATE UNIVERSITY

THE

PATENT L. W. ORTHOPS HOPS 167902.



THE L-W ORTHOPS OPHTHALMOSCOPE

This new instrument is entirely reflecting and eliminates most of the difficulties of ordinary ophthalmoscopy; with the minimum of practice, an excellent view of the fundus is obtained.

The instrument is worked by an ordinary small dry cell battery, measuring $3\frac{1}{4}'' \times 3''$.

It is an instrument that should be possessed by every sight testing optician who wishes to make ophthalmoscope examinations.

It can be obtained from any Wholesale Optical House, from whom a fully descriptive pamphlet can be had on application.

Manufactured by **GEORGE CULVER, Ltd., London, N.1**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

W.H.T.

W.H.T.

THE HALL-MARK OF

Efficiency Service. Supplies.

WALTER H. THOMPSON

66 HATTON GARDEN, LONDON, E.C. 1.

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

J&R.F.LTD

Some Suitable Lines for the Season's Trade

Immediate delivery from Stock.

Reading Glasses — REAL TORTOISESHELL; LOTOSHELL; SHELLULEX; ALUMINIUM; AMOPTOSCOPES

Spectacle and Eyeglass Cases — TORTOISESHELL; SOLID SILVER; A.O.Co. POLISHED ALUMINIUM

Lorgnettes — TORTOISESHELL; LOTOSHELL; SOLID GOLD; SILVER GILT; ROLLED GOLD

All lines are well finished saleable goods. We keep no others.

J. & R. FLEMING LTD.,

Telephone:
HOLBORN {814, 815}
HOLBORN {2788, 2789} Prescription Dept.

136-148 Clerkenwell Road,
LONDON, E.C. 1.

Telegrams:
"OTTICO." LONDON.

Branches with Prescription equipment:

WALTER BRAHAM & Co. Ltd.
8, Key Hill Drive,
BIRMINGHAM.
Phone: Central 2509
Telegrams: "Brahma."

37, WESTGATE STREET,
CARDIFF.
Phone: Cardiff 44
Telegrams: "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1085.
Telegrams: "Ottico."

8, SHUDEHILL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

J&R.F.LTD

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
The Rt. Hon. VISCOUNT HILL, L.C.C.

Upper Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Renter Warden
HARRY HYLTON-FOSTER. Esq., Past Master.

Director of Examinations
The Rt. Hon. SIR WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in May, 1922.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receiv them

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,605

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, DEC. 30, 1921.

The New Year.—We offer hearty New Year's Greetings to the readers of this paper, and reciprocate cordially the good wishes we have received from friends in the optical trade in different parts of the country. We believe that even those least optimistic will join in the anticipation of a marked improvement of the general conditions of trade in the coming year. And, of course, the ophthalmic and optical instrument industries reflect to a great extent the prosperity or otherwise of the community as a whole. The early part of this year saw disastrous labour troubles, which involved great loss to all directly concerned, and might easily have had even more serious results. The staying power of the commercial and professional classes was put to a short but severe test, from which it emerged successfully. Indeed credit must be given also to a majority—probably—of the working class, which includes so many enlightened and fair-minded men, for accepting reasonably reduced rates of pay with appreciation of the fact that such reductions are an inevitable accompaniment of falling prices. A clear, however grudging recognition of the economic law, that wage levels must recede with price levels,

Digitized by Google Original from THE OHIO STATE UNIVERSITY

is now common among the intelligent, better educated workpeople. There may be some real difficulty for them, however, in following the sequence of events, because in a falling market, prices drop so much earlier to the producer than to the consumer of those staple goods that figure in "cost of living" scales, by which the real value of wages is measured. After each break in prices offered to the producer, a period has to elapse for stocks to be liquidated.

* * *

Now the advent of cheaper "living" promises an advantage to be shared among all classes; and it conditions increased spending power for the particular good of industries such as ours. It is a harbinger of better profits in well managed undertakings, and gives assurance of commercial stability. Over and above this advantage, already accrued and steadily increasing, we have reasons for confidence drawn from the political sphere. As an outcome of the Washington Conference we may expect a vast amount of labour to be diverted to productive purposes. The hoped for settlement of the Irish question may well in the near future release an army of occupation. And if not only the naval and military commitments of the Government can be reduced, but also in like degree the civil commitments, by means of the great Axe, there should be a happy reduction of taxation. No doubt these matters are not matters of the moment; but they give ground for confidence, and confidence is a most valuable asset to the business world. So our good wishes for the prosperity of our friends and supporters in 1922 can be expressed in terms of great expectations

* * *

Monocles and a Moral.—Newspaper reports state that in Austria, single eyeglasses are subject to a "luxury tax," from which spectacles are free. According to the 'Chronicle,' of the 15th inst., the municipality of Salzburg imposes a tax of 17 per cent. on every sale of a monocle by retail. In this country local taxation for poor law and other common purposes is, of course, assessed only on rateable value of the various kinds of real property. The contributions of a "luxury" tax, to be levied on purchasers at retail, would lighten the burden upon both residential and business premises—shops, warehouses, and factories. There is a flavour about it akin to the "equalisation of rates" by penalising the rich, which has some charm for politicians who claim to speak in the name of Labour. But the trading community would resent such taxation because it is in restraint of trade, and perhaps not less on account of the troublesome book-keeping involved. Some really important experiments in "luxury taxation" that have been carried out abroad have given far from satisfactory results.

* * *

However the thing may be looked at, any merits of a "luxury" tax on retail sales must depend on its being true to its name. The anomaly of describing as luxuries all monocles of whatever make or price, can only be explained as a concession to prejudice in the minds of an ignorant and stupid class. The more uncultivated among the sons of Demos feel very strongly about those trappings of wealth by which their class consciousness is offended. Particularly hurtful to these people is any approach to what was termed "the nice conduct of a clouded cane"—the wearing easily of some article of dress or adornment which would be worn by them uneasily and therefore absurdly. Some popular journalists write amusingly enough in the vein of satire against those conventional affectations of men who cultivate refined distinction in dress; but starched collars and silk hats, which would be fairer game, must not be offended; so the unfortunate monocle is singled out to be shot at with the arrows of wit, as a symbol of pretentiousness in "men's outfitting." Our readers who are ophthalmic opticians will recall newspaper articles of this type, the publication of which must have injured a small but useful part of their trade.

* * *

To return to the definition of a luxury, monocles are sometimes made in cheap white metal; and so made, if worn for use rather than ornament, they are evidently no more articles of luxury than are spectacles of hospital type. Eyewear that is expensively finished, in expensive material, is luxurious to a greater or less degree. Such distinctions as may be drawn by Government decree in the new fashioned and (happily) isolated democracies of Eastern Europe, between a bourgeois monocle and a plebeian spectacle-frame, reduce class prejudice to a point where it becomes irrational in the extreme.

* * *

The Moral.—Tax collection on retail sales is only a matter of academic interest in this country, for the present at any rate. But the principles on which, for any purpose, a true distinction can be drawn between luxuries and the necessaries of life, concern a subject that is of immediate import to the ophthalmic trade

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

just now. The activities of the "National Insurance Beneficent Society" are directed to cheapening both spectacleware and the opticians' service, for the benefit of insured wage earners. This is a natural enough undertaking, since there is a numerically strong body of recipients of relief, anxious to make the most of their doles. True, the word dole may be objected to, in connection with a contributory scheme of insurance; but the payments out by employers and on behalf of the State are substantial, so that in effect, to a great extent, this is a new extension of the poor law. It may be a good thing, since all such laws are designed to secure to persons living near the poverty line, or who become destitute through misfortune, the bare necessities of life; but surely this does not or should not imply payment for articles of luxury out of the insurance funds. If the argument is a good one, as we think, it should be pressed home; for obviously, conditions of sale acceptable with hospital-quality work would be quite otherwise in connection with the better class of ophthalmic business.

The National Association of Opticians.

The circular letter issued to members of the National Association of Opticians, which circular was referred to in last week's *Optician* (p. 268), is as follows:—

"Dear Sir (or Madam),—You will have already learnt through *The Optician*, and the circular issued by the National Insurance Beneficent Society, of the arrangement agreed upon by the N.A.O. and the N.I.B.S. in regard to sight-testing and the supply of spectacles to insured persons.

"You are earnestly asked to seriously consider the proposition, and loyally co-operate in what is unquestionably a distinct advance towards full recognition of opticians as persons specially qualified to test sight.

"You are requested to accept scale No. 1, indicated on the N.I.B.S. circular, viz.:—

"5s. fee for sight-testing, frame measuring, etc.

"2s. 6d. fee for fitting, etc., when a sight test is not required.

(No extra fee to be charged when two pairs are ordered at the same time).

"Wholesale cost price (for single frames and pairs of lenses) as per any standard wholesale price list. (The firm's name should be mentioned for checking purposes by the N.I.B.S.).

"No arrangement of this kind can be entirely satisfactory to either side, but after considerable discussion and negotiations, the arrangement as above, is the best that could be made. It is fundamentally sound, and forms a true basis for any future negotiations. Moreover, it is the least objectionable, offering as it does, a clear sum as payment for purely professional services.

"Many arguments might be adduced against its adoption. In fact, no *practical* scheme can be framed which would be free from attacks; but exaggerated claims, inaccurate statements and theoretical fancies, do not assist in coming to an understanding with business men who have money to disburse.

"Your Council feel it is a better thing for the whole optical profession to share this money, than to encourage private arrangements with a few individuals.

"Besides, it is the duty of your Council to clear the ground and prepare the way for future developments, and so protect our members from being left outside by the Ministry of Health, or other bodies engaged in the extension of extra benefits in connection with National Health Insurance.

"Therefore we strongly appeal to you, notwithstanding all that has been written on the subject, to give this matter careful unbiassed consideration, bearing in mind that these additional benefits are bound to come, and it is imperative on this account that all ophthalmic opticians in common with the other professions should take up their due share of national health work, and by so doing uplift the status of the ophthalmic profession.

(Signed) A. HERSHBERG, President.
E. MOEVIUS, Hon. Secretary.

"NB.—Kindly fill up the postcard enclosed as directed, and return not later than January 7th, 1922."

European Agency for the Farrington Cases.

The Farrington Manufacturing Co., Boston, Mass, U.S.A., inform us that during Mr. S. Pulzer's visit in America, they made a sole selling agency arrangement with Mr. Pulzer to handle their well-known Farrington cases in the British Isles and the Continent. We congratulate the Farrington Manufacturing Co., and Mr. Pulzer, on having accomplished this arrangement. As an importing house, Mr. Pulzer's firm has been established over a quarter of a century, and is so highly respected throughout the British wholesale trade that we are sure the interests of the well-known Farrington cases are in good hands.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE PRINCIPLES AND PRACTICE OF POLISHING.*

PAPER READ BEFORE THE SCOTTISH SOCIETY OF OPHTHALMIC OPTICIANS.

By Dr. J. W. FRENCH.

Many modern machines embody the principal features of Lord Rosse's machine, although the details may have been varied. Thus in the machine illustrated in fig. 31, two cranks at the rear of the machine are connected to the arm which controls the motion of the smoothing tool.

It may be of interest to note that the abrasive or polishing medium or water, as the case may be, is sprayed upon the tool as it overlaps the work. The spray is shown operated by hand, although under certain conditions it may be done automatically. Spraying systems were introduced by me many years ago and they have proved particularly beneficial as there is no necessity for removing the tool in order to apply the polishing medium or abrasive.

The arrangements of the modern grinding and polishing machines are more clearly indicated in figs. 32, 33, and 34. Fig. 32 is a British two-spindle machine of very robust and good construction manufactured by Messrs. Bryant Symons. Fig. 33 is a single spindle machine of German construction, and fig. 34 a German six-spindle machine.

Optical grinding and polishing machines are very generally characterised by the use of a floating tool. It is a common saying with regard to machine tools in which the axes of rotation of the work and the tool are constrained, that the accuracy of the work cannot be greater than the accuracy of the machine. In the case of a machine tool, 1/10,000″ is regarded as being very good accuracy. Such an accuracy, however is not sufficiently great for optical work where surfaces must be true to a fraction of a wave-length. To ensure good definition an optical reflecting surface should not deviate from the truth by more than 1/8th wave-length, that is, about 1/400,000th inch over a length of about 1 inch. Such accuracy can only be obtained by means of a floating tool which is capable of resting freely upon the surface to be worked.

It cannot be assumed that, having an optically flat tool, the worked surface will automatically be ground flat. Considerable manipulative skill is necessary to ensure the desired perfection. It has already been explained how the rate of abrasion or polishing depends upon the relative speed of the tool and the work. If the tool is central with the axis of rotation of the work, the former will be carried round with the latter and, as there

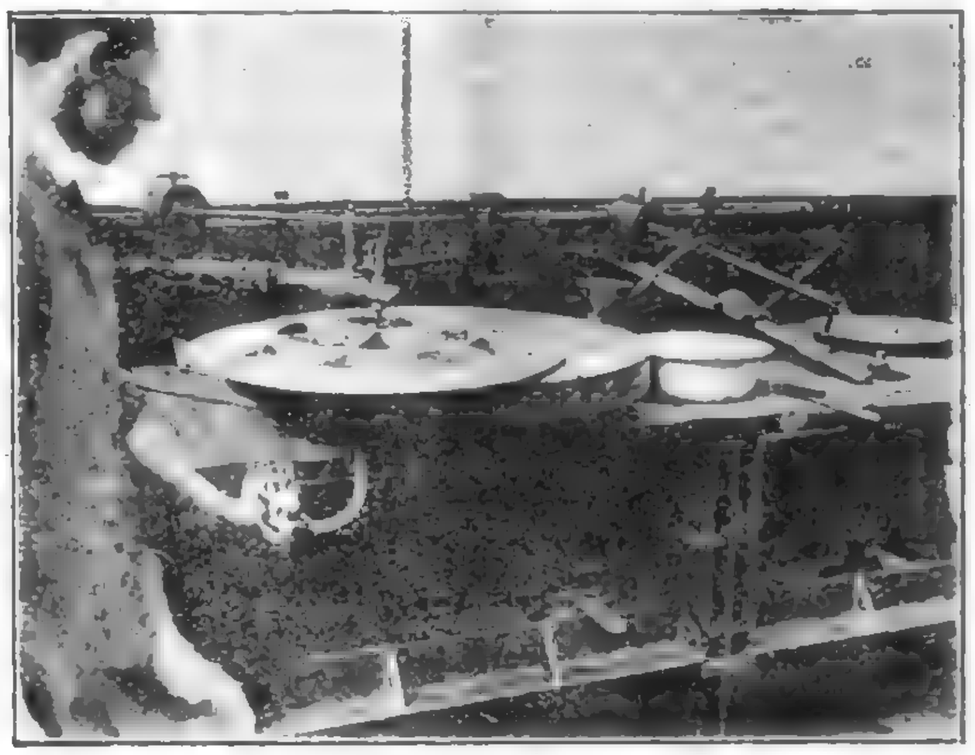


Fig. 31

will then be no relative rotation, assuming no braking devices are used, there will be no abrasion. If, however, the centre of the tool is shifted to a peripheral position, the rotation of the tool will be less and the relative motion will be greater. To calculate the distribution of the wear over the surface of the work is practically impossible in view of the number of the variable conditions. Suppose, however, the tool diameter is much smaller than the diameter of the surface to be worked. If then the tool is displaced so as to operate over the peripheral zones, it is clear that an approximately convex surface would be produced, the outer zones being more worn away than the central zones. But suppose the tool diameter is made to extend beyond the work; then although the work will be ground convex, the wear on the peripheral zones of the tool which are in contact with the work for only a portion of the time will be less than

*Concluded from page 276.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Reasoned Publicity
—A Retrospect

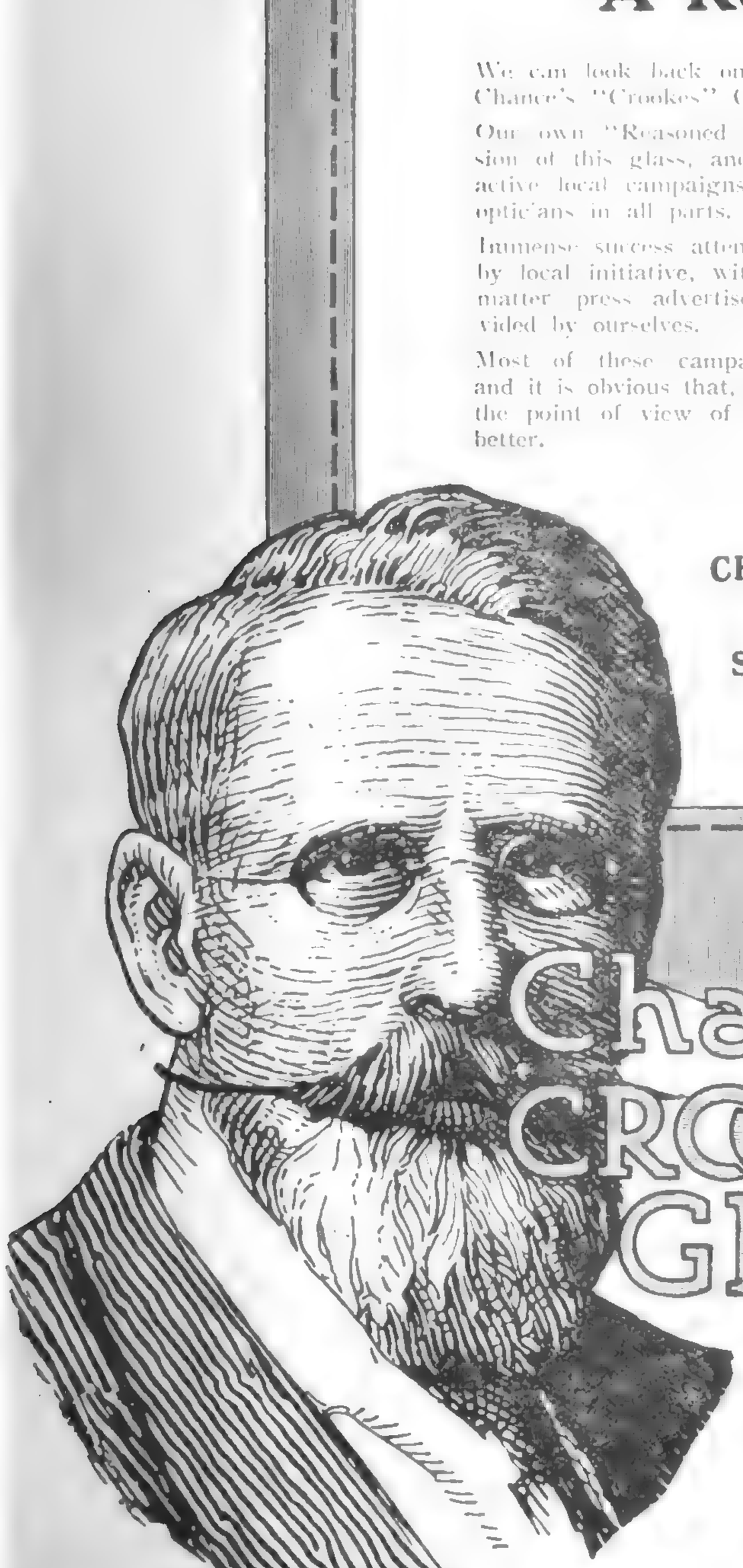
We can look back on a good year's work done for Chance's "Crookes" Glass.

Our own "Reasoned Publicity" created wide discussion of this glass, and prepared the ground for very active local campaigns carried out by enthusiastic opticians in all parts.

Immense success attended these local campaigns, run by local initiative, with the assistance of publicity matter press advertisements and lantern slides—provided by ourselves.

Most of these campaigns are still in full swing, and it is obvious that, splendid as 1921 has been from the point of view of work done, 1922 will be even better.

CHANCE Bros. & Co., Ltd.
Glass Works,
Smethwick, Birmingham.



Chance's CROOKES' Glass

AN INSTRUMENT IS NOW ON SALE TO DEMONSTRATE TO THE PUBLIC THE EFFICACY OF CHANCE'S 'CROOKES' GLASS IN CUTTING OFF THE HARMFUL LIGHT RAYS.

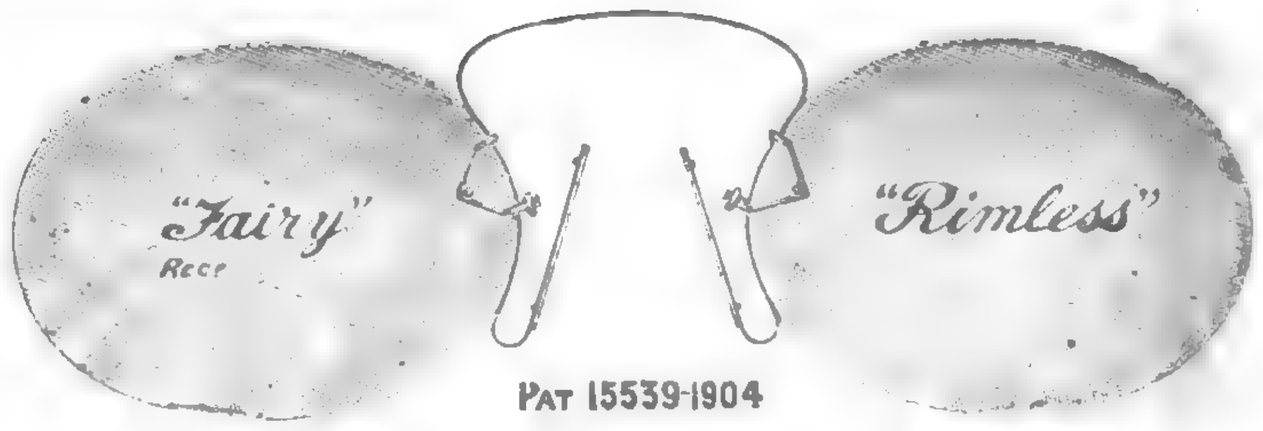
Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Phone:—City 3225 (3 lines) *Telegrams:—Bulford, BARB. London.*

PATENT "FAIRY" REG. MOUNTINGS.

Have taken a distinctive place in the World of Eyeglasses
SOLELY UPON MERITS.



By the Patent Method of Attachment, they, as it were, make the two Lenses and Fitting One Piece, giving that Rigidity upon the face which makes them a pleasure to wear.

Royalty wear them; people of note wear them, and it should interest you to sell them as we make them in Gold only.



There are Points of Refinement in the design rendered possible only by the Patent Method of Attachment to the Lenses.

Made by the firm whose Reputation for Prescription Work is:—*"Second to None."*

NEWBOLD & BULFORD, *Prescription House,*
GOSWELL ROAD, LONDON
E.C. 1

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

that at the centre of the tool, which will accordingly tend to become convex and thus to neutralise the convexity of the worked surface. Thus by altering the length of the stroke and its distribution and the amount of overlap, it is possible to correct any deviations from truth of the worked surface.

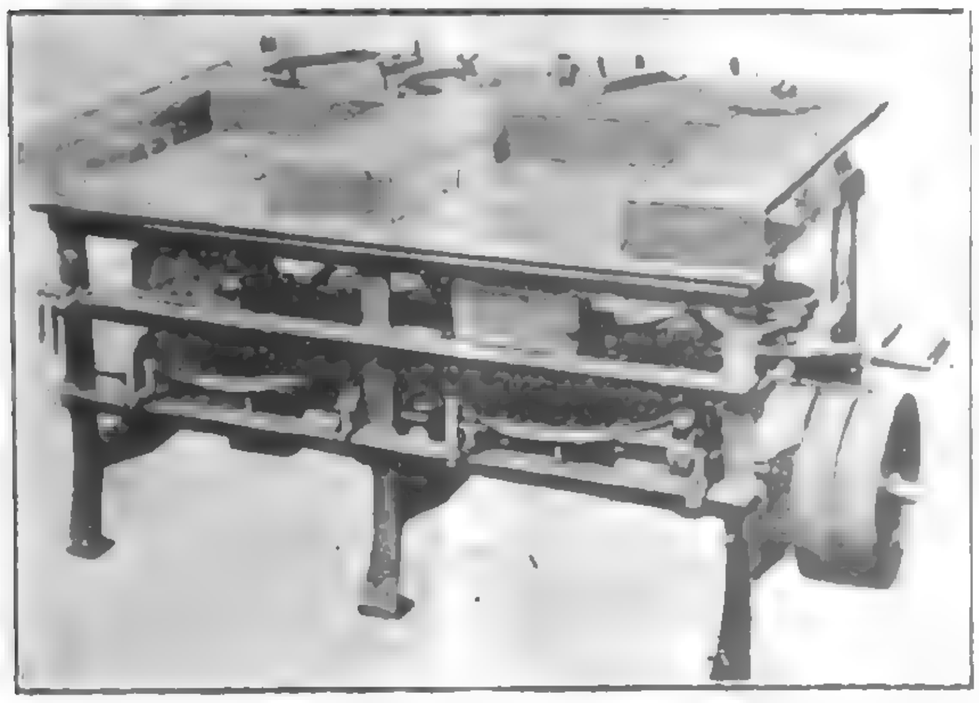


Fig. 32

The same general principles are applicable to curved surfaces, and not only to smoothing tools but also to polishing tools. But in the latter case it is also possible to reduce the acting surface of the polishing tool by scraping at the centre or periphery as may be desired, or by widening the surface grooves and thus reducing the contact surface where required.

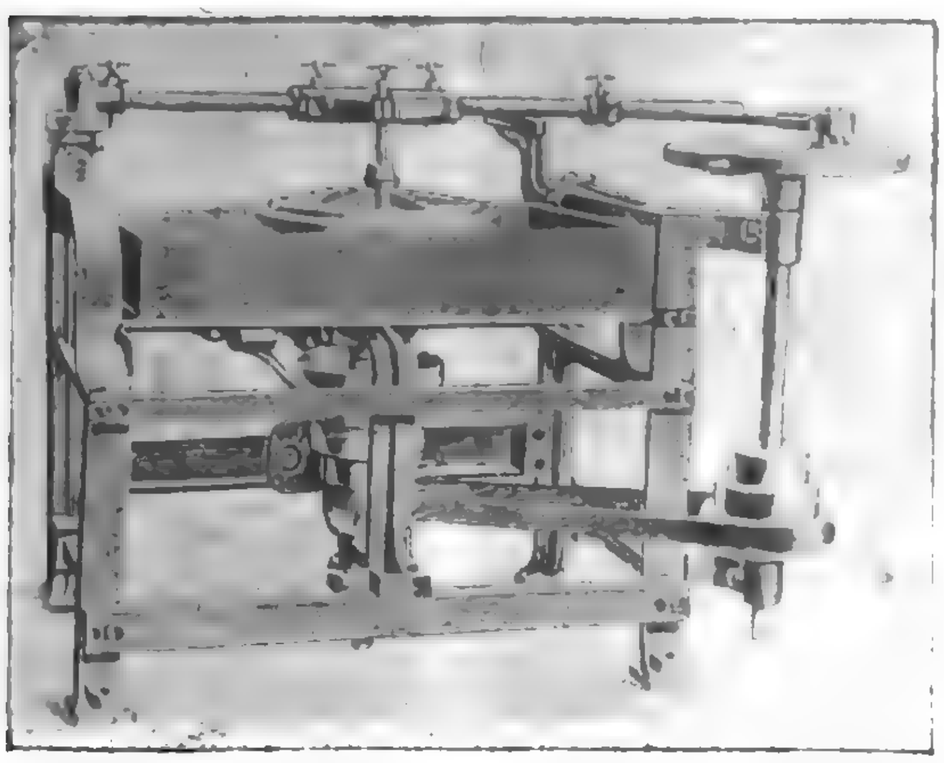


Fig. 33

The principles underlying the manipulation of the surfaces, although very complex, are quite definite. Each particular case is determined, however, by the conditions. Thus, for example, in hand operations where the work lies on the tool, the manipulation is in many cases the reverse of that adopted in the case of machine work where the tool is above the surface to be operated upon. Each operator, indeed, has his own particular method of combining the various adjustments in order to control the figure of the surface.

Optical parts can be worked to the correct

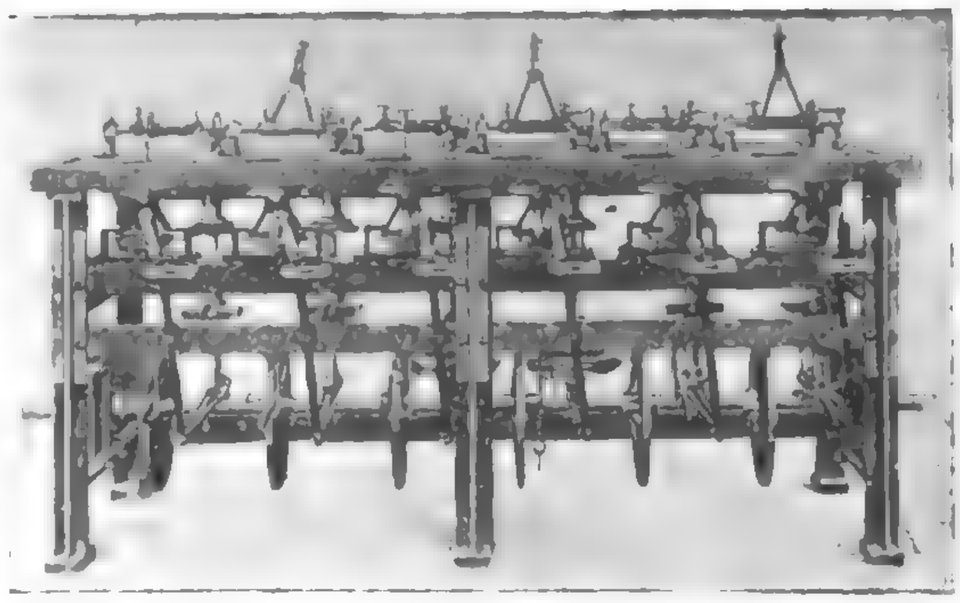


Fig. 34

form preparatory to being smoothed and polished by means of grinding wheels and machines such as are used for the working of metal parts. In fig. 35 there is shown an ordinary Brown and Sharpe grinding machine which has been modified so far as the speed of the wheel is concerned to suit the working



Fig. 35

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

of glass. These machines are very convenient for special work but it will be evident that, so far as the economy of quantitative production is concerned, this method can not compete with surface abrasion. The working contact between the wheel and the surface is at any one moment only a line and for the greater part of the time the surface is not

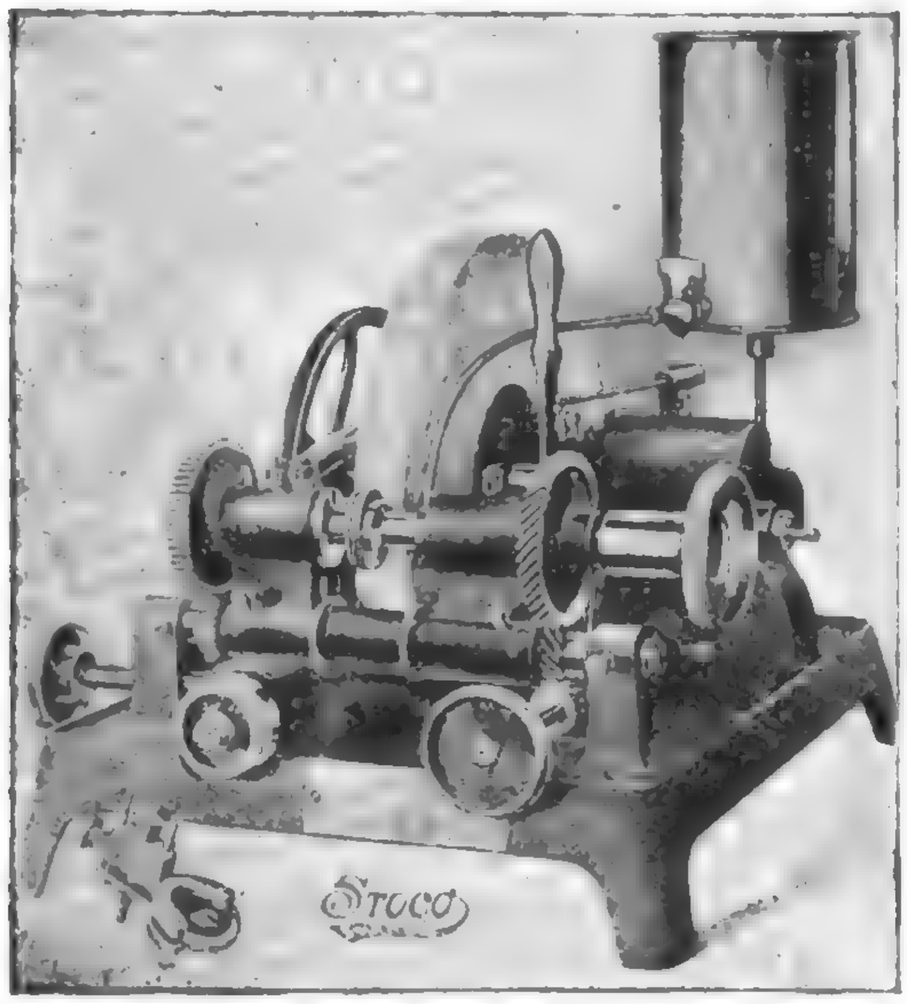


Fig. 36

being acted upon at all, whereas in the case of a surface tool with, say, a loose abrasive every portion of the surface is being acted upon all the time.

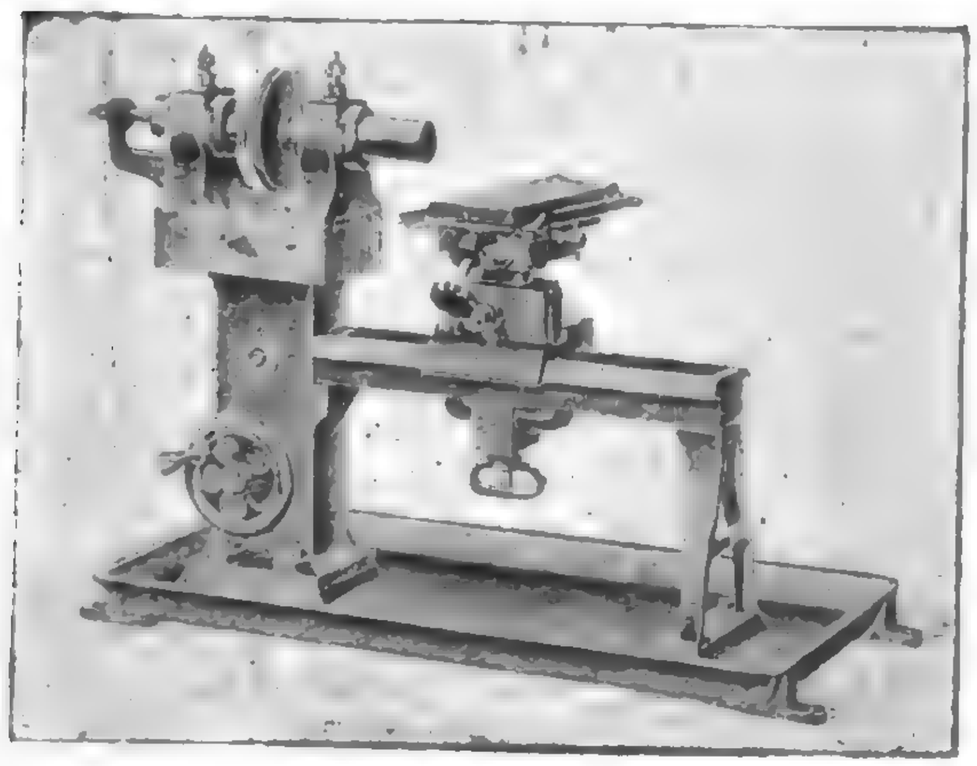


Fig. 37

Grinding wheels are generally used for edging optical parts. One type, which is well-known to all spectacle lens makers is illustrated in fig. 36.

Centering and edging lathes, of which a typical example is illustrated in fig. 37, are commonly used for turning the mechanical edge of the lens true with its optical centre. The actual grinding is done by pressing a brass plate fed with carborundum or emery into contact with the periphery of the work whose optical centre is mounted concentric with the axis of the headstock.

Curved surfaces are produced in practically the manner developed by the early opticians. As an indication of the state of the art nearly 300 years ago, the machine used by Father Cherubin is illustrated in fig. 38. The radius

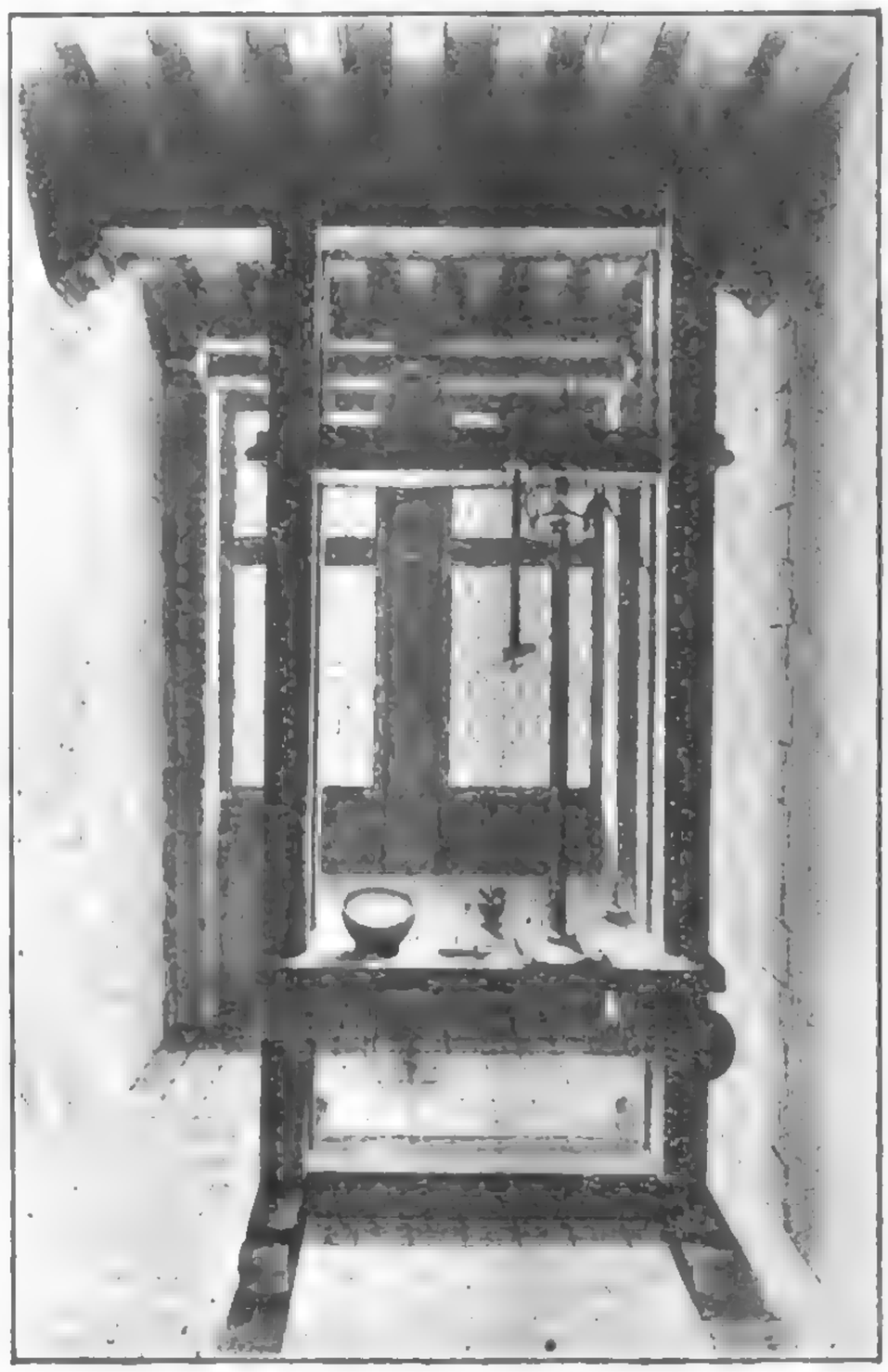


Fig 38

bar, upon the lower end of which is mounted the tool, bears at its upper end against an abutment which can be fed downwards as required by means of the handle placed within convenient reach of the left hand of the operator who grasps the tool with his other hand and works it over the surface.

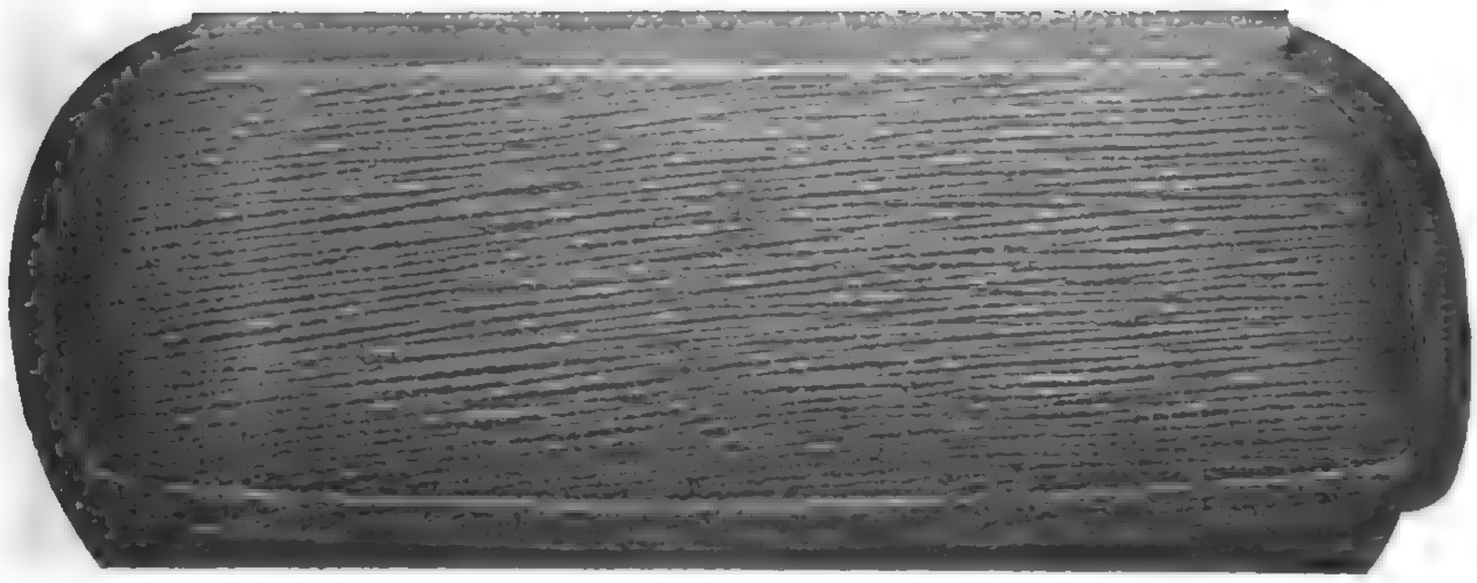
The machine fig. 39, described by Robert Hooke about the year 1665 is worthy of particular attention, as it makes use of a very important principle which enables the curva-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

"WERTEX"

WILLMOTTS'

LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.



11c 11c

First impressions are important, consequently your Testing Room is made attractive.

Lasting impressions are even more important, so complete a transaction by giving an attractive and lasting case.

Use "WERTEX" Cases.

Details and samples from your dealer or direct from the manufacturers.

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

ENGLAND.

B2

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Seven Styles

now made in

"OCENTRIC"

EYEGLASSES

BRITISH MADE.



A Distinctive Model for Each Individual Taste.

RIMLESS MOUNTS & FRAMES. G.F. & SOLID GOLD.

O series Short Plaquets Regular pattern
100 „ Normal Plaquets Regular Pattern
200 „ Long Plaquets Regular Pattern
300 „ For Centrally Drilled Lenses
(BENT UP PLAQUET ENDS.)
400 „ For Centrally Drilled Lenses
(CLAMPS ATTACHED BY SHORT BRACKET.)
700 „ For Centrally Drilled Lenses
(SWAN NECK BRACKETS.)
800 „ Regular Pattern with Double Straps

SAMPLES and PRICES WILLINGLY ON APPLICATION.

The British Ocentric Optical Co., Ltd.,

Wholesale and Manufacturing Opticians,

12 & 13, EAGLE STREET, SOUTHAMPTON ROW,

LONDON, W.C. 1

Telegrams—Ocentricco, Westcent, London. *'Phone—Holborn 560*

Cables—Ocentricco, London.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

ture of the surface to be altered by a simple variation of the angle between the axes of rotation of the tool and the work. The tool consists of an iron ring K which is filled with sand or other abrasive material. The work Q on the head of the rotation spindle is ground to a spherical form which is determined by the projection of the circle K in a plane containing the axis of rotation of the work Q. Thus supposing the axes could be placed at right angles to each other, the radius of the work would be the radius of the tool. As the inclination of the axes is reduced, the radius of the work increases.

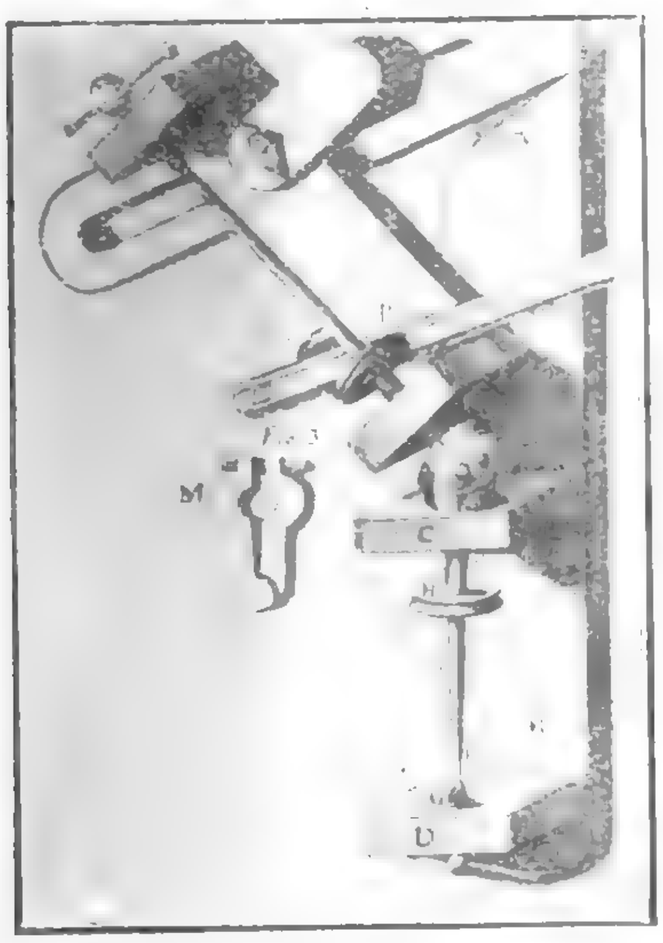


Fig. 39

Machines involving this principle of Hooke are in use at the present day. But the type of machine most commonly employed for curved work and particularly for longer focus lenses, a large number of which can be mounted on one head, is identical with the type of machine used for flat work. Fig. 40 shows a head of concave lenses which has just been removed from the convex smoothing tool on the spindle of one of these machines.

Spectacle lens work fortunately does not involve great accuracy in the production of the surfaces, owing to the magnification to which the surfaces are subjected being practically unity, and it is possible, therefore, to make use of machines of a comparatively simple type such as is indicated in fig. 41. It will be observed that the floating tool is driven eccentrically by a pin at the end of a crank on the vertical rotating spindle. The majority of spectacle spherical lens machines are of this type with minor modifications.

Figs. 42 and 43, which have been kindly provided by the United Kingdom Optical Company are illustrations of the Mill Hill plant. They show a number of machines of the simple type already illustrated.



Fig. 40

Although with, perhaps, the exception of spectacle work, the surfaces to be produced by the optician are usually either flat or spherical, there is a growing demand for non-spherical surfaces. For example, in the case of motor headlights of the best quality, reflectors of parabolic or elliptic section are used, and in many cases the surfaces are optically worked. It will be understood that in the production of such forms it is necessary to work the various zones independently to the appropriate curvatures, and that only by the application of very expensive hand processes and apparatus is it possible to produce

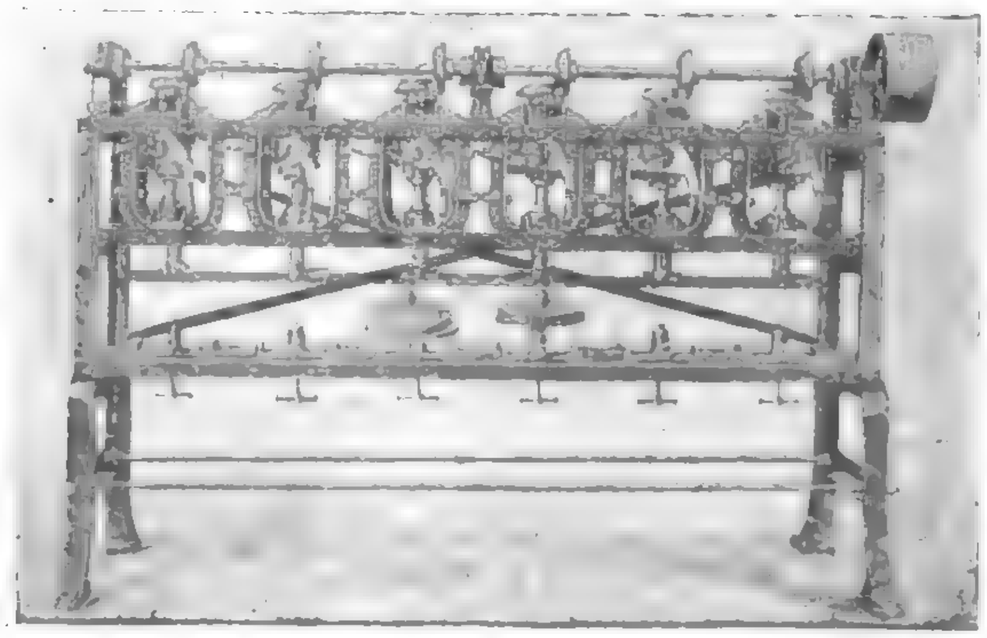


Fig. 41

truly regular forms. For motor car headlights such regularity, however, is not required.

Figs. 44 and 45 show the machine opera-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

tion of retouching the zones of non-spherical convex and concave surfaces.

Cylindrical and toric lenses are very frequently used by the ophthalmist. For the production of cylinders the surface of the tool is formed to the appropriate cylindrical shape



Fig. 42

and while it is rocked say in a transverse direction over the surface of the lenses, the head carrying the latter is moved in a longitudinal direction. A battery of cylindrical lens machines installed at the works of the United Kingdom Optical Company is illustrated in fig. 46.



Fig. 43

Toric lenses which may be either convex or concave have different curvatures and, therefore focal lengths across different sections.

For the production of single lenses the machine illustrated in fig. 47, which is of a type very well-known to ophthalmists is commonly employed. The tool is worked to the appropriate curves in the two directions and is oscillated over the surface of the work about an axis and transversely in the direction of the axis. The machine illustrated is shown operating upon a convex and a concave lens.

In the manufactory, however, it is necessary to use a different type of machine capable of producing lenses in multiple. A battery of typical convex toric lens machines as installed

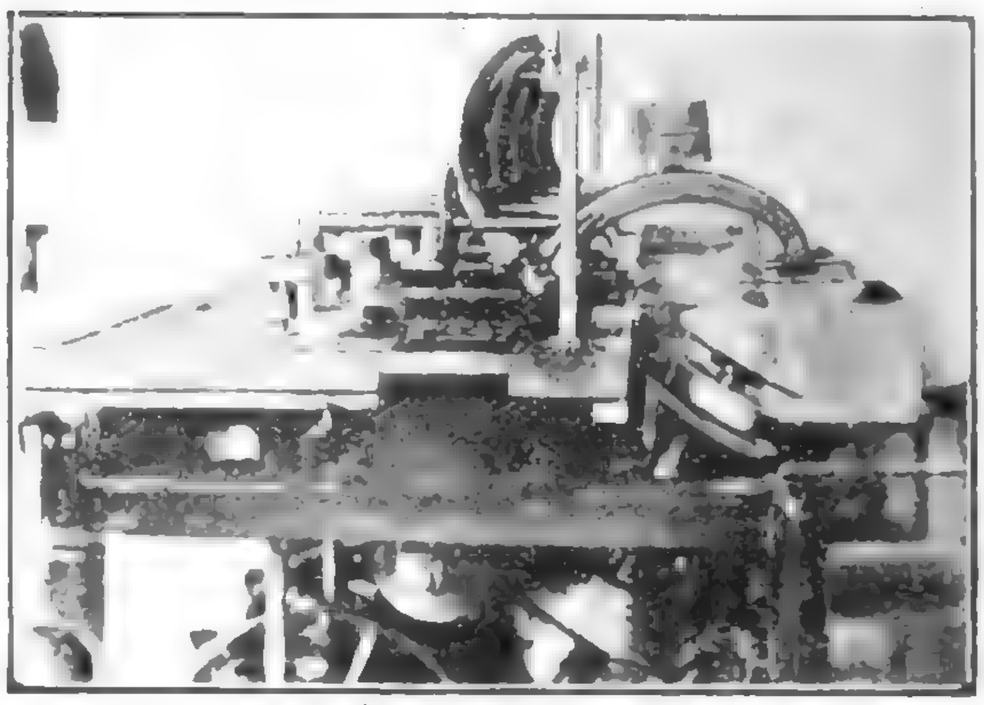


Fig. 44

at the Mill Hill works is illustrated in fig. 48. The lenses are mounted upon the periphery of a drum whose radius corresponds with the desired focal length of the lens in one direction. The tool has a similar curvature in the plane of the wheel. The tool, however, in the transverse plane, may have a different curvature corresponding with the other desired focal length. The tool is driven by a crank pin on the vertical rotating shaft and the wheel carrying the job rotates about its axis. For concave toric lenses the parts are mounted within an annular ring and the tool, which is worked to the corresponding convex curvatures, operates upon the inner surface. The principle involved is identical with that of the convex toric machine.

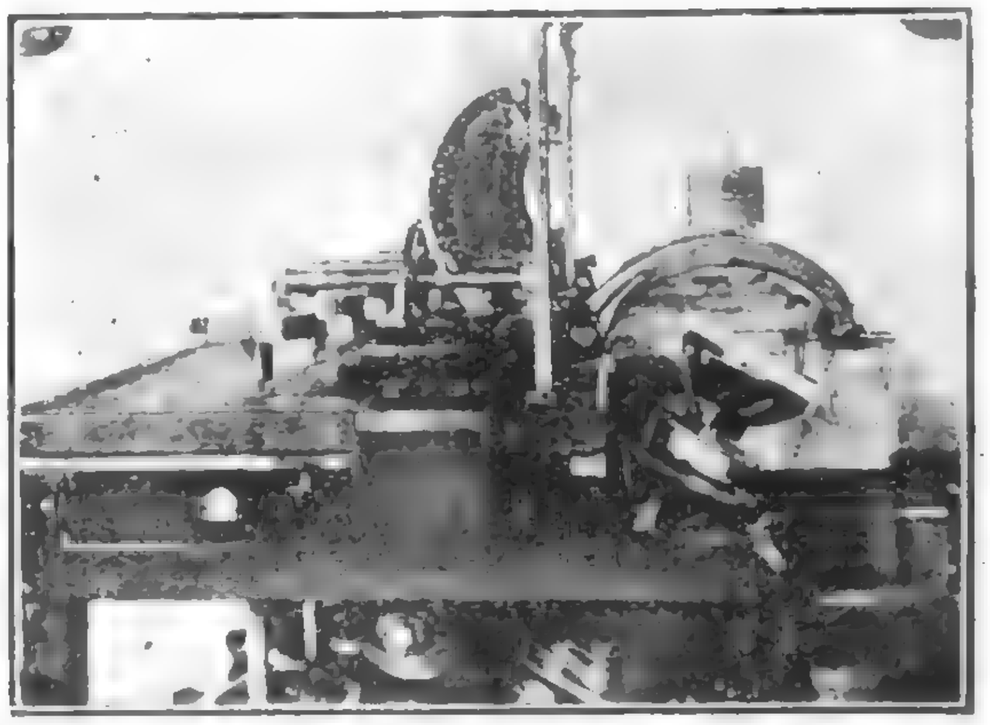


Fig. 45

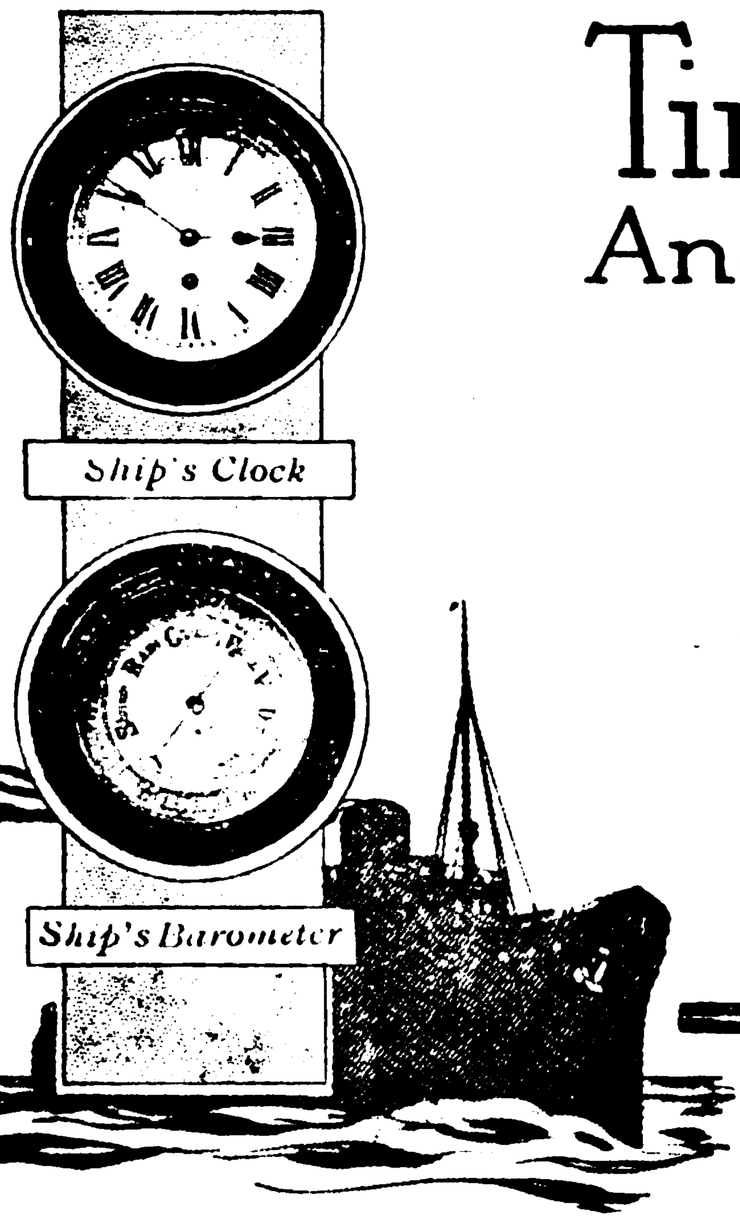
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

T. A. R. & Co.

"THE ALL BRITISH HOUSE."

Over 2,000 Designs in Aneroid Barometers.



Time and Tide
And Ship's Instruments



T. A. REYNOLDS & Co
40-1-2 PERCIVAL STREET,
LONDON E.C.1



Steam-pipe Thermometer *Hydrometer*

Telegrams—
"THERBAROME. LONDON."

Telephone—
339 CITY.

Showrooms and Offices at above address.

If you are a Retailer and need ORIGINAL LINES in Barometers, Clocks and Thermometers, write us, and although we will not supply you direct, we will put you in touch with the Nearest Wholesale House.

WHOLESALE AND SHIPPING TRADE ONLY.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Dear Friends,

That the New Year may prove a happy and prosperous one for you all is the sincere wish of

Yours very truly,

S. PULZER.

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

You cannot do better than start the New Year by insisting on being supplied with the products of the following well known firms.

DUPAUL, YOUNG OPTICAL Co.,

Gold-filled and Xylo Spectacleware.

BISHOP COMPANY, Inc.,

Gold and Gold-filled Eyeglass Chains and Silk Eyeglass Ribbons.

FARRINGTON MANUFACTURING Co.,

Eyeglass and Spectacle Cases.

WILLSON GOGGLES, Inc.,

Goggles for Sun, Glare, Dust and Wind

ALSO

All types for Industrial Eye Safety.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. Telephone: CENTRAL 7241.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

WHOLESALE TRADE ONLY.

W. Smythe & Co. Ltd.

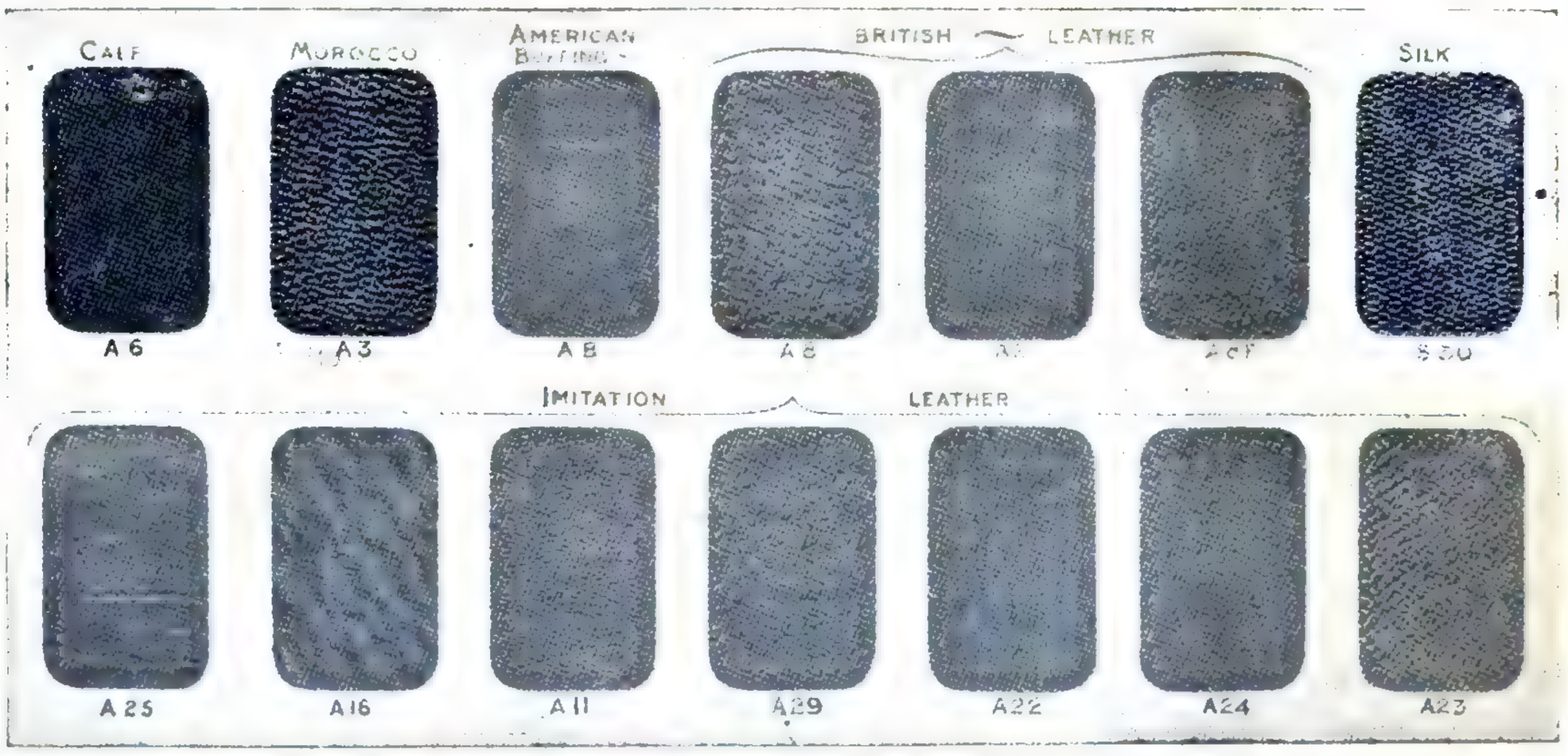
Head Office: 66 and 67, EDWARD ST. PARADE, **Birmingham**

Branch Works—HOCKLEY AND WALSALL.

Patent Optical Case Manufacturers



ALL OUR GOODS CAN BE COVERED WITH THESE MATERIALS AND VELVET.



ILLUSTRATIONS HALF-SIZE. COMPETITIVE PRICES

Also Makers of Patent Spring Lid Cases "NOWATE" Write for List and Prices.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

A machine having three spindles, one for the working of cylinders, the intermediate one for the working of concave torics, and the third for the working of convex torics, is illustrated in fig. 49.

During the past summer I had an opportunity of visiting in an official capacity all the principal German optical factories, and in conclusion I should like to refer briefly to the position of the industry.

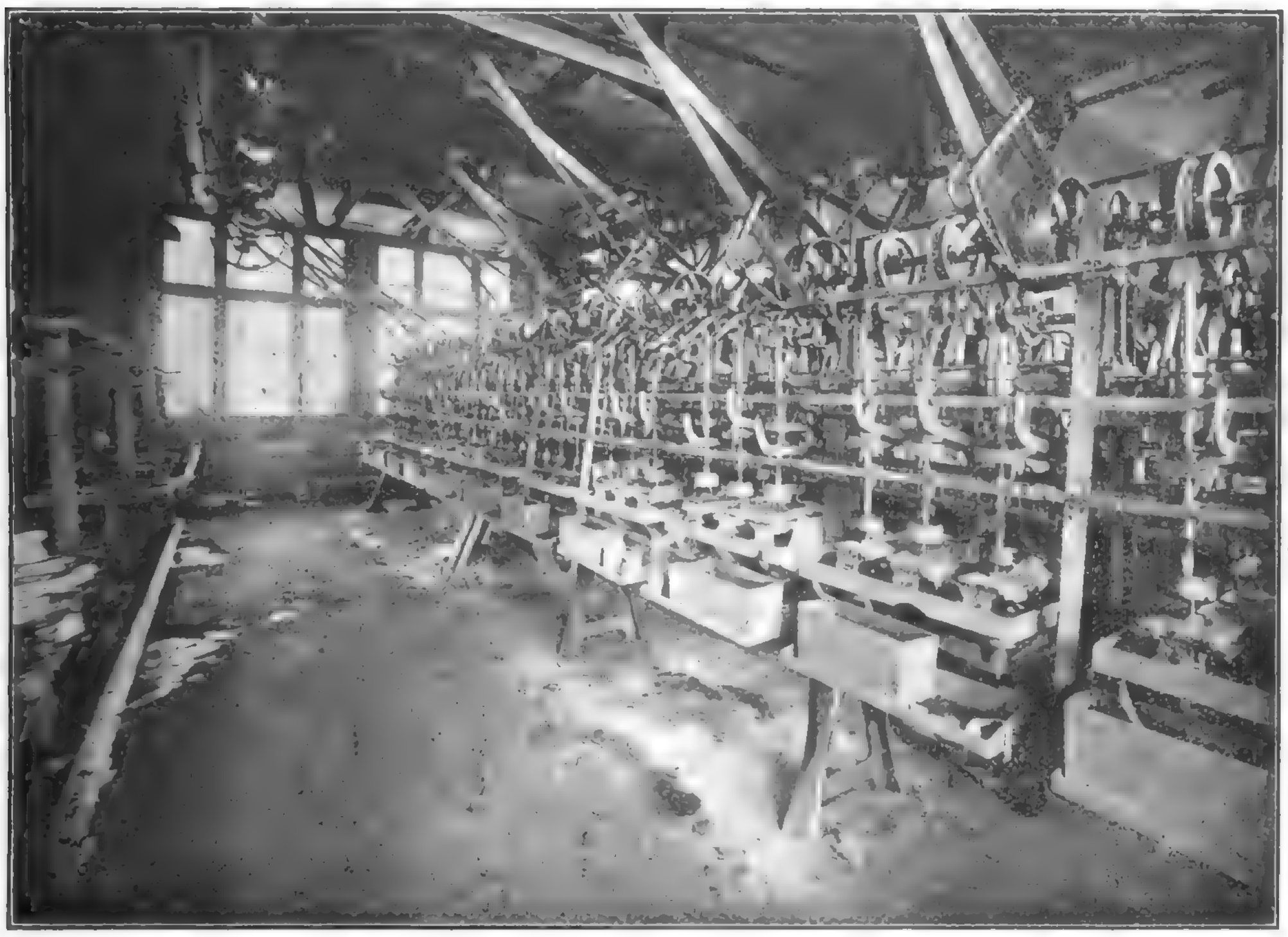


Fig. 46

Early in 1920, the rate of exchange in Germany was over 250 marks to the pound, and as a result of this and, the war reaction the German optical industry was extremely prosperous. In the summer of 1920 when I was first there, the rate of exchange had dropped to 150 marks and the industry was in a most depressed condition. Many of the factories were working for stock principally with the object of keeping together a nucleus of good men. To-day, the rate of exchange is very great and if there is a demand for optical work the German optical industry must be again active, but in the summer of this year I saw no evidences of real activity.

That a high rate of exchange should be favourable to Germany is largely attributable to the fact that practically the whole of the work done in the winning of the raw materials and in producing the finished article is expended within the country. In a German optical instrument the proportion of the imported material is less than 2 per cent.

Anyone who expected to find a country that has lost a great war and has suffered a revolution to be in a state of chaos would, no doubt, be astonished to find at the present time no marked surface evidence of either the war or the revolution. To the casual visitor the conduct of life in Germany appears very little altered. In the great cities places of entertainment are nightly crowded and the popular restaurants are well filled. It should be remembered that it was the intention of Germany to make the Allies pay for more than the cost of the war. There is little reason to doubt that, if the opportunity had been granted her, she would have done so. This being the intention, industry was not taxed as in this country. Many people in Germany, therefore, have accumulated great wealth and

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

even yet the taxation appears to be much less than in this country.

The workers, however, are not in so fortunate a position. The wages of a skilled optician had increased six-fold by 1921, but the cost of living had increased at least ten-fold. That the standard of life of these people has been much lowered soon becomes apparent to anyone who comes into real contact with them.

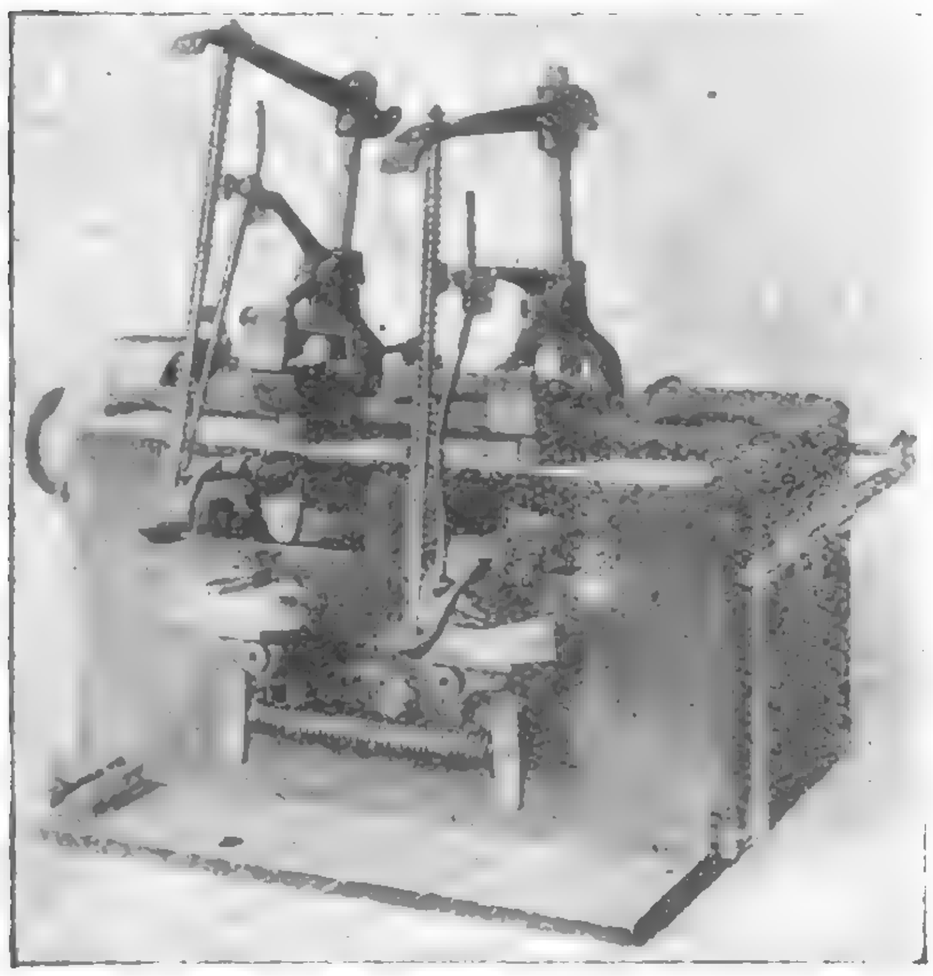


Fig. 47

It might be thought that as a result of the revolution, the conduct of industry would be seriously affected. So far as management is concerned this is true to some extent. The management has to face many minor organisation difficulties which did not previously exist. But last summer there could be little complaint regarding the earnest attention of the men to their work. This summer there appeared to be some change for the worse in this respect. Universally the attitude appeared to be that, if the country could settle down, the German industry would not only retain its old position but would advance. Whatever the political feelings of the individual might be—and the political aspects are very complex—all were unanimous in stating that their defeat was only temporary and that the time would come when they would get back all they had lost and probably more.

In view of such a feeling it will be evident that the competition of the German worker must be a very serious factor. The position is rendered all the more serious by the fact that the manufacturer is in possession of ample capital and that in many cases the equipment of tools is very extensive and of an excellent kind. It is characteristic, however, of the German industry that it depends to a large extent upon skilled labour which is less plentiful now; that the methods in use to-day are practically identical with those in use before

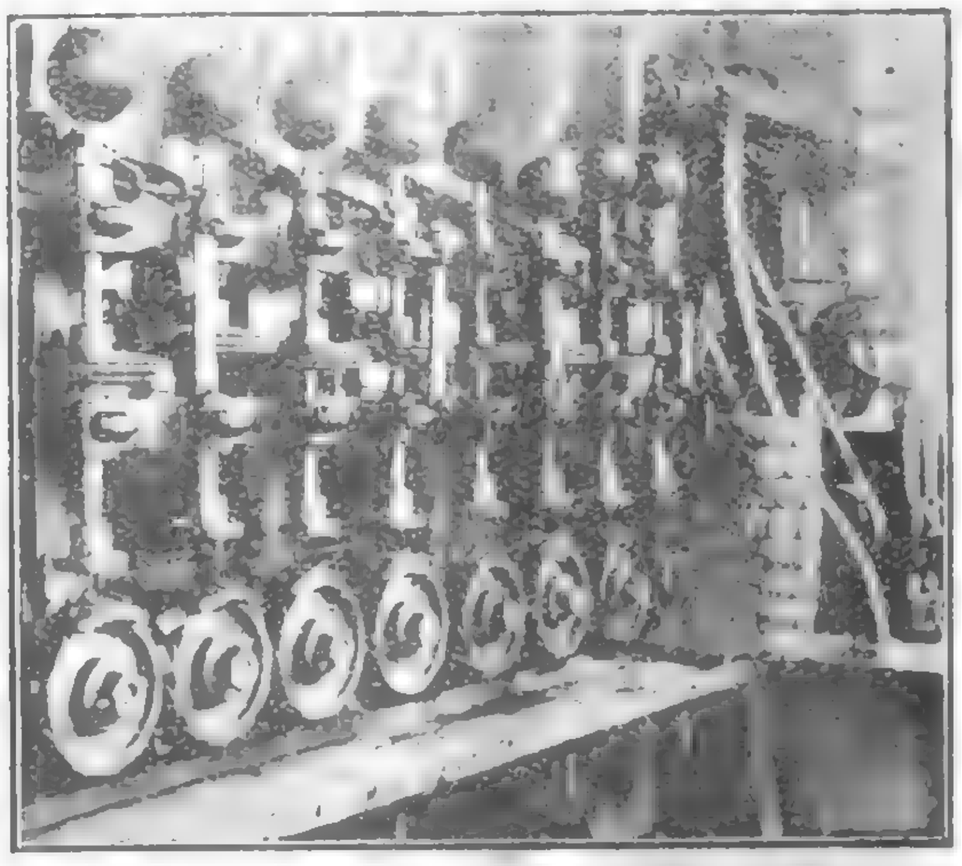


Fig. 48

the war; and that there is no evidence in Germany of the great development of manufacturing methods that has occurred in this country.

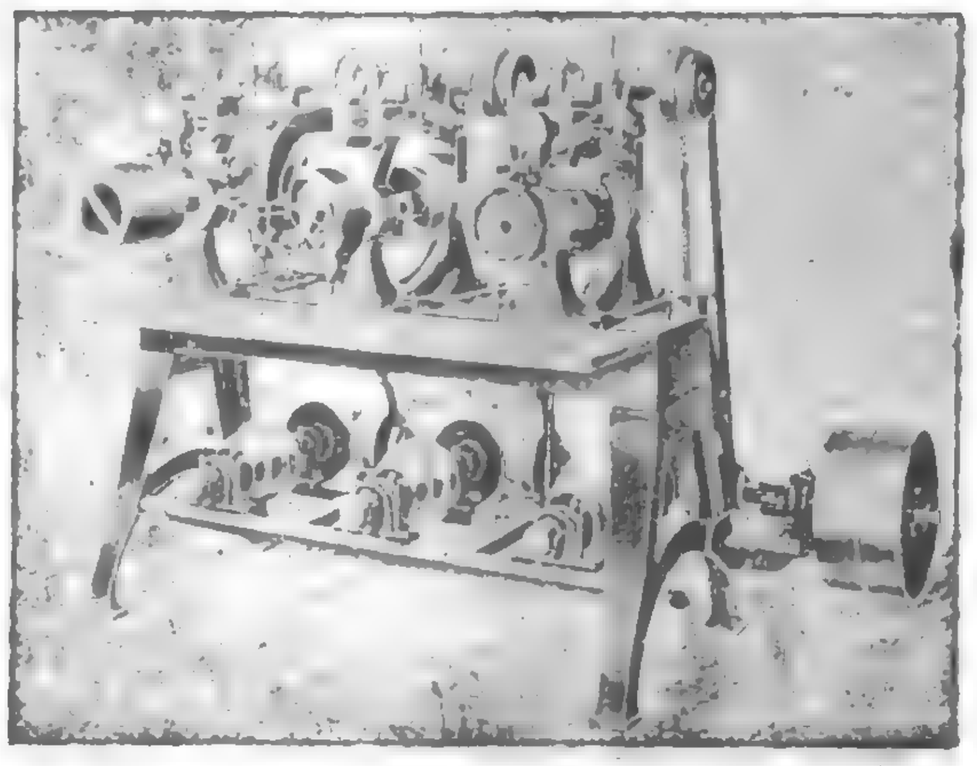


Fig. 49

In no factory were methods of a novel kind in use. The machinery employed was all of well-known types. Several of the plants for the manufacture of spectacle lenses, were very large and complete. During the war, Messrs. Zeiss of Jena, employed from twelve to fourteen thousand people, but the numbers de-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Elliott Optical Company

wish you

a Year of Happiness and Prosperity,

during 1922.

MANY SUCCESSES IN THE EXAMINATIONS!

Your Opportunity to

QUALIFY IN OPTICS

PRACTICAL WORK. Students taking the Course may receive personal tuition in the practical work AT ANY TIME DURING THE COURSE.

Expert Tuition by Correspondence for the SIGHT-TESTING DIPLOMAS of the Worshipful Company of Spectacle Makers (F.S.M.C.), or the British Optical Association (D.B.O.A.).

Write for full particulars—

C. A. SCURR, M.P.S., F.S.M.C., F.I.O., etc.
64, High Street - - - - BARNET.

J. WHEELER,
55, St. John Street, Oxford.
Wholesale Optician
and Manufacturer's Agent.

The cheapest House for B.S.O. Astigs $\frac{1}{10}$ to $\frac{1}{40}$, F.M. Frames, Cables and S/S, $\frac{1}{10}$ and $\frac{1}{40}$, recently purchased from the bank.

We also hold large stocks of Edged and Unedged Lenses; price list on application.

For Wholesale Only.

WE WISH YOU ALL A PROSPEROUS NEW YEAR.

NOW! WHAT ARE YOU DOING TO MAKE IT PROSPEROUS?

ARE YOU QUITE SATISFIED WITH YOUR

RX SERVICE

OR THE PRICE AND QUALITY OF YOUR

STOCK SUPPLIES?

IF NOT WE CAN OFFER YOU A

QUICK AND ACCURATE SERVICE AT REASONABLE PRICES

SEND YOUR ORDERS NOW TO

Telephone: HOLBORN 1620 (Private Exchange).

KIRK BROTHERS
WHOLESALE & MANUFACTURING OPTICIANS

Telegrams: KIRBROREX, HOLB. LONDON.

36, GRAY'S INN ROAD, LONDON, W.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

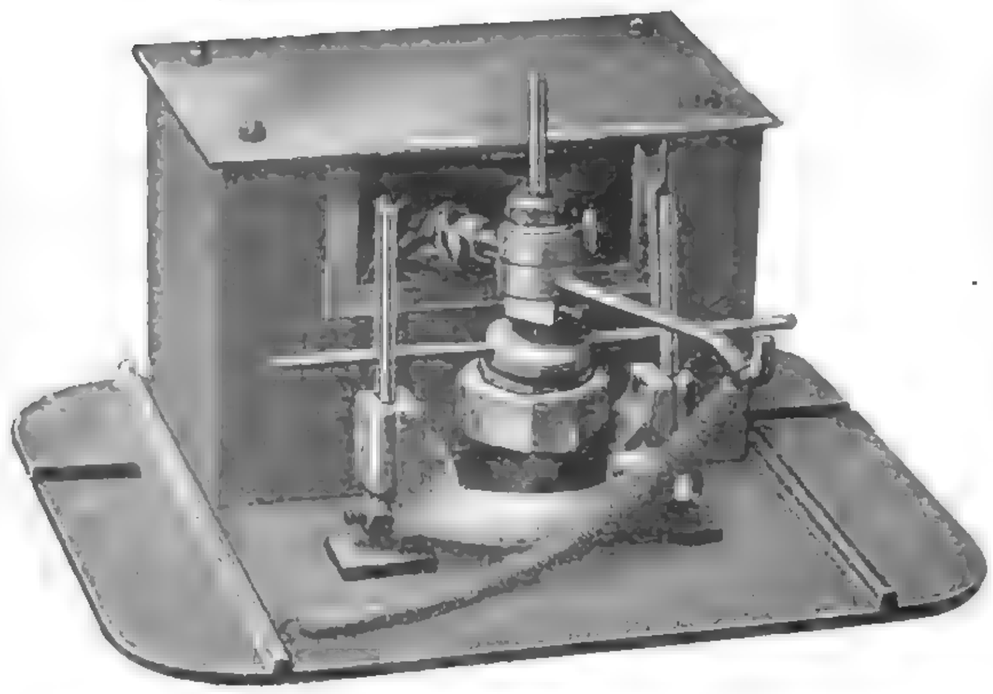
"SOMCO"

AUTO-SURFACING MACHINE.

PATENTED IN
GREAT BRITAIN
U.S.A.
FRANCE
GERMANY.

LONDON
MADE.

Ask for Quotations.



Requires Only 1/6 H.P.

TOOLS
GAUGES
SURFACING
SHOP EQUIPMENT
OPTICAL MACHINERY & INSTRUMENT REPAIRS.

SURGICAL & OPTICAL MFG., Co.,
22, Union Road,
Clapham, London, S.W.4

THE
GLASSIE
LENS CLEANER

Known to all progressive opticians as the best advertising medium extant.

Samples and Prices from all Wholesalers or direct from :—

THE GLASSIE LENS CLEANER Co
156 CHARING CROSS ROAD. LONDON. W.C.2.

The Mark Dacol *of Distinction*

Only High Grade and High Quality

BINOCULARS

have this mark.

Full particulars from
DAVIES COLEMAN & Co., Ltd.,
45 & 46, Fetter Lane,
London, E.C.4

Telephone : HOLBORN 2597.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

creased in 1920 to about five thousand, and this summer were still much greater than they could usefully employ. As an important part of Zeiss's work was of a military and naval character which is no longer permitted, it is only natural that Messrs. Zeiss should direct their attention to the mass production of civilian articles such as spectacles. Messrs. Goerz of Berlin, during the war also employed about fourteen thousand people, and it is understood that they also had in view the mass production a new type of spectacle lens, designed by Dr. Gleichen.

It will be evident from the above remarks that the German manufacturers have the intention of more than retaining their old markets.

So far as technics and general knowledge are concerned, I personally am convinced, that given reasonably equal competitive conditions in this country a continuation of the present industrial peace and a general will to work together on behalf of the industry, this country would be quite able, not only to retain the industry, but also to re-attain its old position of pre-eminence in the sphere of optics.

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

Visual Equivalence of Lenses.

Sir,—Mr. Mayer strikes a personal note in his last letter which on account of the distorted references and quotations made without regard to their context is little calculated to yield a correct impression of the present writer's views.

The first part of his letter may be dismissed since the writer does not claim what Mr. Mayer imputes (*vide* the preceding sentence to the one he quotes (22nd July, 1921) "Now Mr. Whitwell has shown. . . ." etc.).

The reader who cares to refer back to the writer's original articles and letters will find a consistent opinion with regard to spectacles and near vision since his reply to Mr. Mayer's first article attacking the *vertex marking* principle on the grounds of near equivalence not being ensured.

I can only satisfy Mr. Mayer, perhaps not then, if I give my own method of solving the problem immediately on my return from the Xmas holidays. I am not disposed, however, to prolong the discussion with him by letters which place the personal element before scientific investigation.

WILLIAM SWAINE.

The Proposed Optical Panel.

Sir,—In reference to the offer of the Council of the N.A.O. of the professional services of their members for the sum of 5s., may I express my amazement at their generosity, or is it their modesty, at thus valuing their services? Do they realise, I wonder, that the scheme will not create new business, but means that a great deal of present business will simply be sidetracked through another channel. If so, their philanthropy is worthy of recognition, if not in this world, then in the next.

It is very evident that the majority of the N.A.O. members have not been consulted in this matter, and probably the ears of the Council became unpleasantly warm when their offer was read by the members.

I should like to take this opportunity of congratulating Mr. Smith on his letter in *The Optician*, of December 16th, which meets with the approval of many qualified men with whom I have discussed it.

F. R. PAXMAN.

641, Rochdale Road, Manchester.

Sir,—Re Optical Insurance.—It used to be a much decried custom to advertise sight-tested free. Apparently the modern counterpart of this is to be too professional to make a profit on one's merchandise. Frankly, I am sceptical if, with the best will in the world on both sides, one could evolve a satisfactory insurance scheme that would cover more than the supplying of a W.M. spec. Anything more than that (*e.g.*, gold, gold-filled, rimless, toric, kryptok, etc.), are a gratifying of the desire for a good appearance, and people wear these rather than W.M. for the same reason that they wear a fur, a necktie, a pendant, or a ring; so why should the optician be expected to supply at cost price any more than is the jeweller or outfitter? Again, a doctor who prescribes unnecessarily expensive drugs is liable to be brought to book. Why then should an insurance society design to supply

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

gold, gold-filled, and rimless articles, when W.M. are equally satisfactory from a utility standpoint.

I have been a sight-testing optician for sixteen years, and it seems almost incredible to me that anyone should propose that a fair remuneration for testing the refraction should be the same as that for taking facial measurements, and that for the privilege of doing these one should keep and supply stock at prime cost. On these lines we should never need a Bill to regulate the practice of sight-testing. We should need a Conscription Bill to compel us to carry on.

YORKIST.

Early Sight Testing.

Sir,—Up to now Mr. Braham has not replied to the request of Mr. Capel and myself. It is hoped he will now come up to the standard of *a gentleman*.

J. PARRY MORTON.

Dowlais.

Sir,—Your correspondents may suggest that I have some reason for withholding the particulars of my qualification, but I submit to you, that before I am called upon to furnish this information it is only fair that some of our leading lights, say for instance, Mr. ——, should be asked to quote the date of his Examination, the man or men who examined him, and what his certificate consists of. When a few of the leaders of our profession, many of whom have not had such a lengthy optical experience as myself, have obliged by doing this, it will be quite time enough to call on me for a similar statement, and then (but not before) will I consent to give the information requested.

G. BRAHAM.

167, The Grove, Hammersmith, W.6.

New Company.

G. H. Zeal, Ltd.—Private Company.—Capital, £5,000 in £1 shares. To carry on the business of meteorological, surgical and scientific instrument makers, etc. The first directors are: G. H. Zeal, 57, North Gate, Regents Park, N.W.8 (permanent chairman), H. H. Zeal, Brudenall, Altyre Road, East Croydon, and R. O. Zeal, 57, North Gate, Regents Park, N.W.8. Qualification, £100. Registered Office: 82, Turnmill Street, Clerkenwell, E.C.

The G.O.C., Xmas 1921.

In former years the General Optical Co., of Ely Place, Holborn, have provided their staff at Christmastide with a real old-time Christmas party.

This year, however, it was felt that a change might be appreciated, and on Saturday, the 17th December, the firm entertained their employees by taking them to the matinee performance of "Cairo," at His Majesty's Theatre, after which the company (52 in number) met at The Bun House, Holborn, to partake of high tea.

Needless to add, everyone present thoroughly enjoyed both their visit to the theatre and the good fare provided at the Bun House. Hearty votes of thanks to Messrs. E. T. & F. W. Cornwell at the close, brought to an end what by general agreement, had been a very enjoyable afternoon and evening.

An application has been made to the London Bankruptcy Court for the discharge of Charles Drury Browne, trading with David Endacott, as the Endacott Scientific Instrument Co. The liabilities were £59,362. It was anticipated that a dividend of between 5d. and 6d. in the £ would be paid to the unsecured creditors. The Registrar granted the discharge subject to judgment for £5.

Now that the

Key Industries

BILL is Your

PROTECTION

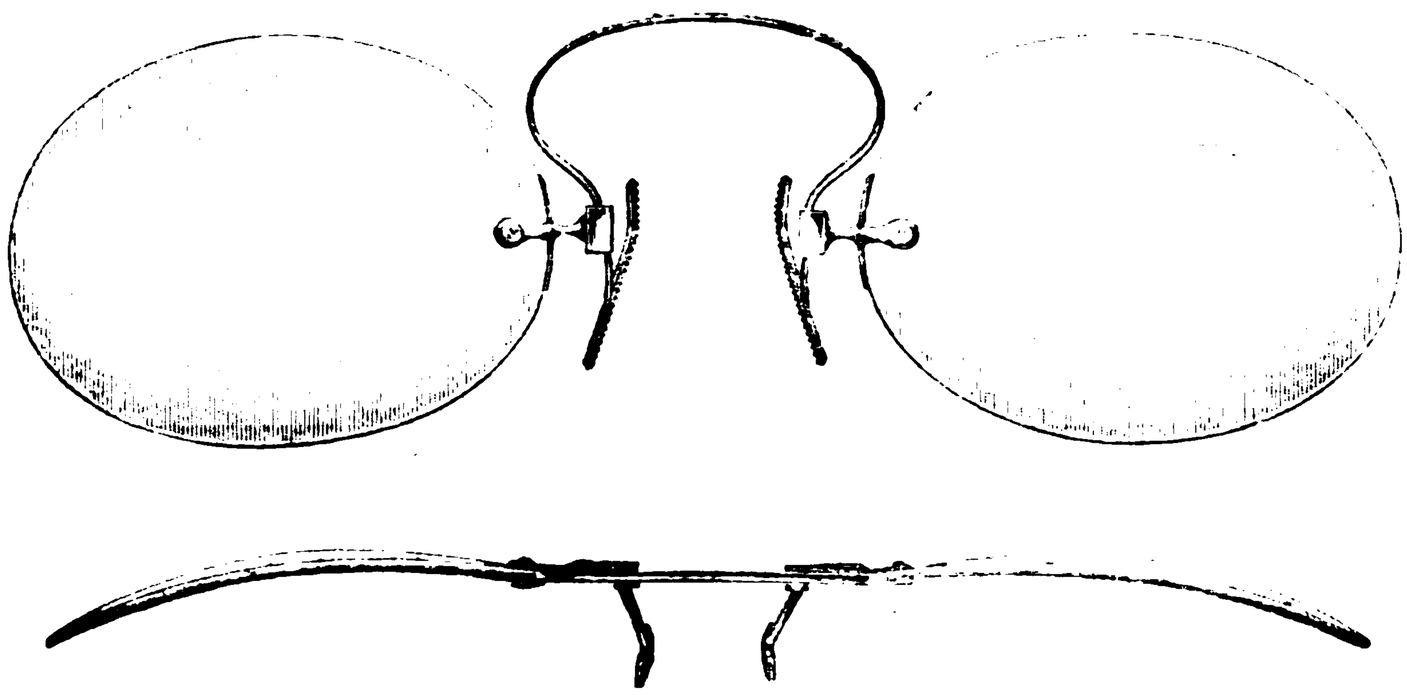
Why not Advertise in
The OPTICIAN and Reap
All the Advantages
which you should do by the

BILL

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Lyon's
"Standard" Offset Mounts
For Accurate Fitting and Exact Alignment
Optically Perfect.



No. 893 GOLD No. 1293 GOLD FILLED.

Smart in Appearance and Comfortable to Wear.
Easily Adjusted.

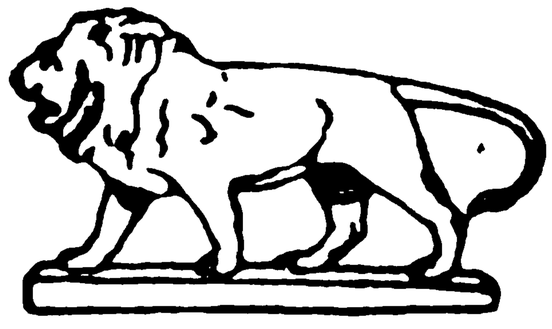
FULL STOCK OF STUDS, SPRINGS AND GUARDS. FITTING SETS SUPPLIED.

F. H. C. Lyon,

Wholesale and Manufacturing Optician,

59-61, Hatton Garden, London, E.C.1

Telegraphic Address:
CYLTORREXO, SMITH, LONDON.



Regd. Trade Mark.

Telephone No.:
HOLBORN 1203.

Digitized by Google Original from THE OHIO STATE UNIVERSITY



The hand of Time applies the acid test to merchandise and men. Many are found wanting; they fall by the wayside. A few possess that element which men call QUALITY. Time cannot efface their greatness.

REALFIT Finger Piece Frames and Mountings are Quality products. Whether you buy to-day or next month, *always* you can be certain of their uniform high standard—of their comfort, beauty and enduring strength.

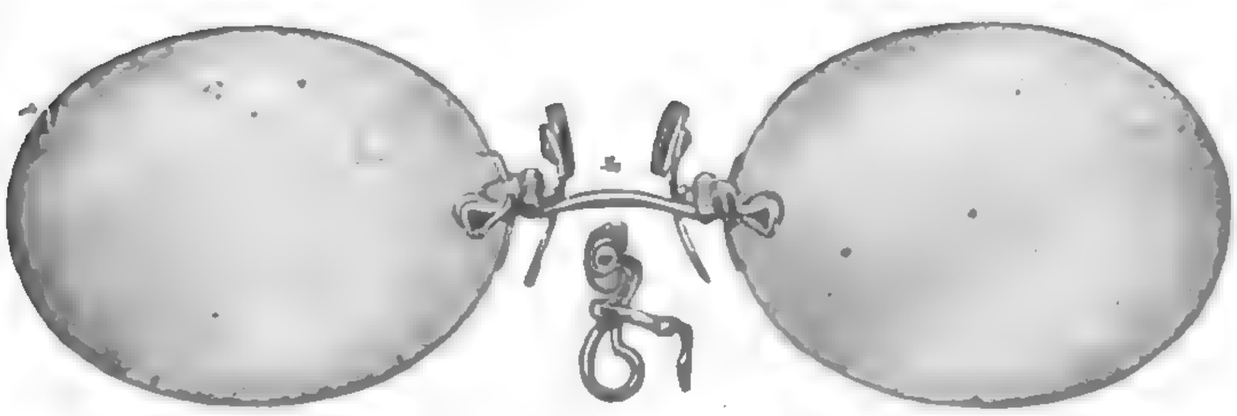
The best material is used throughout. Every part of the mounting is constructed with great precision.

No less than five inspections testify to the care exercised that no REALFIT should leave our factory unless it is absolutely perfect.

REALFIT

Finger Piece

Mountings and Frames.



Made in all standard sizes with a complete assortment of Guards. If your Wholesaler cannot supply you, write us.

NEW JERSEY OPTICAL Co.,
Newark, N.J. . . . . U.S.A.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

"You Cannot TRADE SQ MARK *Buy Better"*

STEVENS' QUALITY
Optical Goods

UNQUALIFIED approval meets this celebrated line wherever introduced.

WE are sole agents for the United Kingdom and can invariably supply your requirements from stock.

One Quality Only—The Best Made

1/10th 12ct. Gold Filled

Specialising in the Fingerpiece Mount

Send us your enquiries for
Spectacles and Eyeglasses—Frames and Mountings

Complete Catalogues on Application

H. WILLIAMSON Ltd.
Optical Section
87/89 GREAT SAFFRON HILL, LONDON, E.C.1

General Optical Supplies—Prescription and Repair Work—
Fittings and Instruments—Optical Machinery

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

Tuition for the Company's Examinations in Optics and Sight Testing at

THE SCHOOL OF OPTICS Ltd.

2, GUILFORD PLACE, LONDON, W.C. 1

Particulars on application.

PRESCRIPTION SPECIALISTS.

Midland Lens Co Ltd

ALSO UNCUTS. TORICS A SPECIALITY.
DALE STREET, COVENTRY.

PERCY S. DE SAULLES.

Manufacturer of . . .

MICROSCOPICAL GLASS SLIDES.

Micro Cover Glasses, Glass Cells and Cavity Slips, etc.

The Platts, Amblecote, Stourbridge.

C. BAKER 244 HIGH HOLBORN LONDON

Estab. 1765

YOUR REQUIREMENTS however exacting, will probably be met from our Second-hand Stock

WRITE TO-DAY FOR LIST, POST FREE.



OPTICAL BLOCKS

To illustrate all features of Optical Service. Write for lists.

CHEMISTS' DESIGN SERVICE
12 Humberstone Gate, LEICESTER.

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
C. A. DYMOND, M.I.Mech.E., F.I.C.P.A

W. P. THOMPSON & CO.,

12, CHURCH STREET, LIVERPOOL.

Chartered Patent Agents.

H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

T. WHEELER,

Scientific Instrument Manufacturer,

Specialities: POCKET SURVEYING and AERONAUTICAL ANEROIDS.

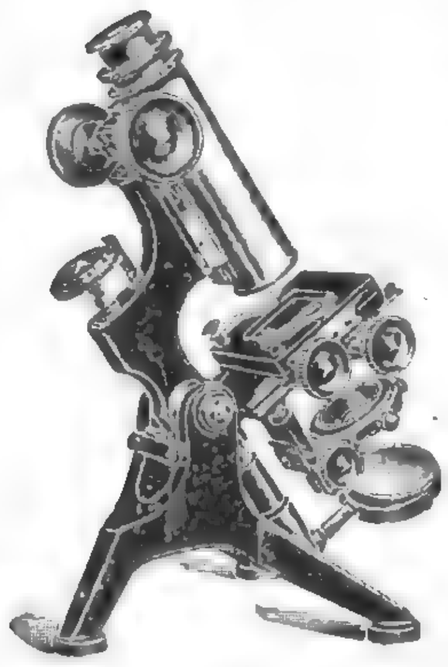
217, GOSWELL ROAD, LONDON, E.C. 1

ESTABLISHED 1878 **TELEPHONE CITY 419**

SELL WATSONS' BRITISH-MADE

MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,

313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1937.

The Optician's Handbook.

Price 4s. 0d. Post Free.

An elementary text book required by every student of Optics.

It is an introduction to "The Study of the Refraction of the Eye, its Anomalies and their Estimation and Correction by means of Glasses.

The Hatton Press, Ltd.,

125, Fleet Street, LONDON, E.C.4

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,

DANDURAND BLDG., MONTREAL.

Cable "Optical" A.B.C. Code 5th. Edition.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Style's the thing!



TO-DAY the live, up-to-the-minute sight-testing optician is selling glasses on the basis of style. He's telling his patrons that they *can* wear their Shur-on glasses for tennis or horseback riding; they *can* wear their Shelltex rimmed spectacles with an evening gown, but it isn't the proper thing. The proper thing is to have the glasses fit the occasion.

The proper thing is to have proper Shur-on glasses for reading, for evening wear, for street wear and for sports.

In the Shur-on line, which comprises more than 996 different styles and types of eyeglasses, spectacles and cases ("Quality Beyond Question" since 1864), the optician has the widest possible range of dependable optical goods to select from. Be critical, say "SHUR-ON" to your wholesaler.

Shur-on Optical Co.,

Rochester, N.Y. U.S.A.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d. per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

ATTACHE Trial Case, orthops trial frame, Morple Morton luminous ophthalmoscope, hand perimeter on stand. £17 or near offer. Would separate, all guaranteed. Box 3512, c/o "The Optician," 125, Fleet Street, E.C.4.

FOR SALE. Half-plate stand camera, mahogany, 10" ext. Beck-Steinheil Unofocal Ser. 1., No. 5. f/6 with Beck Celverex shutter, T.B. to 1/80 sec., 3 mahogany double dark slides, stand, focusing cloth, waterproof case, the whole £3 10s. Also ¼-plate Holborn reflex, magazine 12, Ilex, R.R. f/77. T. and I to 1/100 sec. Leather case, £2. Please address, Box 3508, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

SMALL Optician's business for sale, large Lancashire manufacturing town. Small ingoing, stock optional. Box 3511, c/o "The Optician," 125, Fleet Street, E.C.4.

FOR SALE, as going concern established optical business situate central position, Bath. For full particulars, apply A. H. Brewer, 22, Milsom Street, Bath.

Don't tolerate it!!

If in your opinion your work is not being returned as fast as might be —just try the Willesden Way.

Address your next box of jobbing to W.O.W.—see what they can do.

You have the Willesden guarantee for quality—all the time, and the difference in price is in your favour,

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY:
DUDDEN HILL LANE, N.W.10

Rx

SANDRO LOWY

Optical Rx Specialist,

88, Goswell Road,

LONDON, E.C. 1

Telephone: CITY 304 (two lines)

Telegrams: SANOPTIC, LONDON.

Rx

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Pin your faith to L.O.C. for all your Rx Work and you will have frequent cause for self-congratulation.

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris. France.

Also at—2, Str-Barsei, Bucharest, Roumania.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

A.—**Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 0d; additional words, 1s 0d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 0d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

BRANCH Manager wanted. Must be expert at fitting Boston eyeglass mounts. Applicant must be of good education and it is requested that he should give his full experience in first letter. Box 5799, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Man, 18, seeks situation as stockroom assistant. No experience. Box 5800, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACE Worker wanted, thoroughly experienced in all branches of Rx work, able to act as charge hand if required. Apply, J. B. Jacquemin Bros., Ltd., 65, Hatton Garden, E.C.1.

WANTED. Charnley & Sons, require first-class rimless edger, fitter and repairer in their workshop. Apply, 597, Lord Street, Southport, Lancs.

WANTED for Yorkshire city, refractionist, having passed F.B.O.A. or F.S.M.C. Give age, references and salary required. Knowledge of jewellery an advantage. Box 5798, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, a good bevel and rimless glazer, a good rimless driller and fitter, smart prescription room assistants. Only experienced hands need apply to General Optical Co., 32., Ely Place, Holborn Circus, E.C.1.

YOUNG LADY requires situation, clerk or receptionist, Liverpool district, 5 years' experience with leading firm. Clarke, 44, Northbrook Street, Liverpool.

GENTLEMANLY Youth just left school wishes an apprenticeship to learn sight-testing in a first-class establishment, to live in. Provincial town. 207, High Street, Stoke Newington, N.16.

SMART Salesman and expert fitter with knowledge of sight-testing required for London. State age, experience and salary to Box 5797, c/o "The Optician," 125, Fleet Street, E.C.4.

RIMLESS Edger and fitter accustomed to best class work required immediately. Apply, giving age, particulars of experience and salary required to Mr. Reid, 3, Queen Street, Exeter.

YOUNG MAN requires situation in any capacity. Apply Box 5801, c/o "The Optician," 125, Fleet Street, E.C.4.

RETAIL or Wholesale position in London required by unqualified refractionist, 9 years' experience, including management of general optical trade. Good appearance and address, thoroughly reliable in every way. Studying for S.M.C., only reason for seeking change. Box 5771, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION as branch manager or first assistant required in London or suburbs. Passed S.M.C. examination excepting one subject, careful refractionist O. & S. methods. Can do all repairs, also edging and fitting. Good all-round knowledge, own test case, etc. Box 5767, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED for abroad, experienced sight-testing optician, qualified preferred. Apply, Lawrence & Mayo, Ltd., 19, New Oxford Street, W.C.1.

YOUNG Lady, D.B.O.A., F.S.M.C., with general optical experience, desires a position in London, moderate remuneration. **Box 5790, c/o "The Optician," 125, Fleet Street, E.C.4.**

YOUTH, 19, requires situation where further knowledge of optics could be obtained, has had three years' experience in Jeweller Opticians. Witham, 20, High Street, Abingdon.

LOCUM TENENS, retired, elderly, experienced, qualified sight-tester and practical rimless fitter, requires occasional employment, days, weeks or months, any time or distance. Apply, Box 5786, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., 21, requires position as first assistant. Fully experienced, and can take full charge. Box 5788, c/o "The Optician," 125, Fleet Street, E.C.4.

MECHANIC used to meteorological and general instrument work, hand-turning bench, finishing and lacquering. 18 years' experience, any distance, town or country. F. Orford, 83, Ashmore Road, Paddington, W.9.

JOBBER wanted to take charge of small workshop, with very good all-round experience. Reply, full particulars, wages. Benn Franks, 44, Saville Street, Hull.

QUALIFIED Opticians wish to recommend their first assistant. Good refractionist and salesman. First-class man for charge of prescription workshop. Box 5780, c/o "The Optician," 125, Fleet Street, E.C.4.

LADY desires post as clerk, 5 years' general office experience,, quick at figures, typing. Good references. Box 5778, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS rimless fitter and glazier, both bevel, shell and rimless, bifocal work, 11 years' experience, seek post. Box 5777, c/o "The Optician," 125, Fleet Street, E.C.4.

SITUATION required by good all-round man, well up in refraction and all repairs and rimless work. Also Kryptoks and cement bifocals. Able to take entire charge. Apply, Box 5781, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST, used to working class trade, good retinoscopist and salesman, 20 years' experience, open to engagement. Optician, 49, Hazlewood Avenue, Newcastle-on-Tyne.

REFRACTIONIST, young lady, age 25, thoroughly experienced in all branches of sight-testing, desires position as assistant to sight-testing optician. Used to sole charge. Midlands preferred. Box 5773, c/o "The Optician," 125, Fleet Street, E.C.4.

LOCUM TENENS disengaged, capable and experienced refractionist, thoroughly reliable and practical workman, used to management. Excellent credentials. Box 5774, c/o "The "Optician," 125, Fleet Street, E.C.4.

ASSISTANT requires progressive berth. Passed S.M.C. examinations except one subject. Good refractionist and salesman. Can do all repairs. In or near London preferred. Box 5779, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. London man of good address, over 15 years' experience, expert in sight-testing and fitting, smart salesman, at present managing branch, seeks change, similar capacity. South Coast or London preferred. Box 5784, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, age 19, requires position, good testimonials. Able to do all Rx work, repairs, and attend customers. Would be indispensable to retail optician doing own jobbing. J. Gasson, 52, Battersea Park Road, S.W.11.

ALL-ROUND Jobber, rimless fitter and V-edge, etc., seeks situation in Glasgow. Box 5783, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACER (all-round) seeks situation (male). Box 5764, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED Young lady required for prescription department. Box 5736, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED Refractionist (F.S.M.C.), keen and energetic, age 33, good address and appearance, desires engagement. Careful tester, with clinical experience, London or near preferred. Apply, Box 5766, c/o "The Optician," 125, Fleet Street, E.C.4.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE MIDGET



OPERA GLASS

(Licensed under Patent 12148/1912.)

(Actual size of Illustration.)

Perfect Interpupillary Adjustment.
Superior Lenses.

Claims immediate attention and commands ready sale.

Choice variety:—BLACK MOROCCO, GILT, FANCY LEATHER, PEARL, etc.

WRITE FOR SAMPLE.

R. ARCHER & SONS, Ltd.,

1, AMWELL STREET, LONDON, E.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

AMERICAN·OPTICAL·COMPANY, LIMITED

Wellsworth Gold-filled Spectacle Mountings for Perfection of Detail.



The stock that goes into Wellsworth gold filled frames and mountings is handled by Wellsworth workers and Wellsworth processes from the initial coin and bullion to the final drawing of gold filled wire. This is why Wellsworth Gold Filled Frames are superior in durability and in resistance to corrosion. They are Wellsworth made all the way.

When ordering from your jobber, ask for *Wellsworth* Gold Filled Frames.

WELLSWORTH

TRADE Ⓐ MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C. (Printed by The Century Press, Fulham), Dec. 30, 1921.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1606 FRIDAY, JAN. 6, 1922.

ROSS BINOCULARS.



British Government Tests have proved these to be the finest Binoculars in the world.

Send for our new catalogues and terms.

ROSS Ltd., Clapham Common, LONDON, S.W. 4

ELLIOTT'S Rx SERVICE

leaves nothing to be desired.

ACCURACY—PROMPTNESS and REASONABLE PRICES.

104/5, GT. SAFFRON HILL, E.C.1



STOCK OPERA GLASSES NOW—

For Pre-duty Prices.

For the Coming Season.

ARCHER SELECTION.

R. ARCHER & SONS, Ltd., 1, Amwell Street, London, E.C.1

Reg'd at the G.P.O. as a newspaper **PRICE 4d** *Subscription post free 12 months 17s*

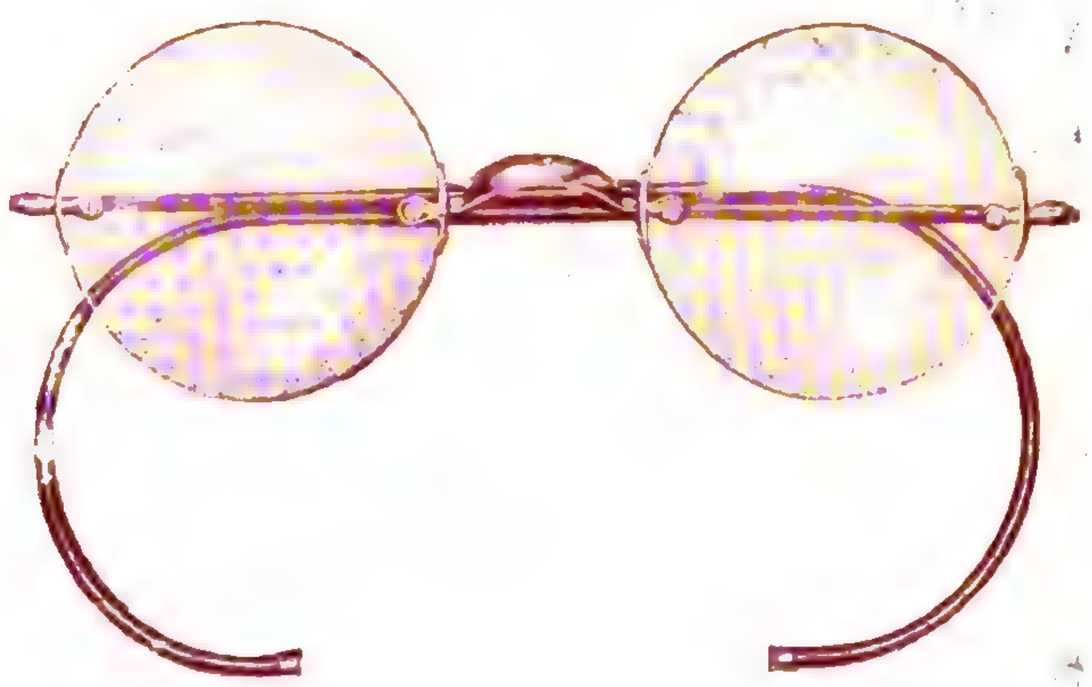
Postage in United Kingdom **1d**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

"Optical Almanac," post free **20s.** *yearly. The Hatton Press, Ltd., 123-5, Fleet St., London E.C.4*

AMERICAN·OPTICAL·COMPANY, LIMITED.

More Rimless Business—



Zyl-Crest Rimless Mounting

The Wellsworth 8169 mounting offers an opportunity to meet the demand for zylonite with a rimless mounting of the highest class. It consists of regular metal bridge covered with a seamless tube of zylonite, and zyl covered temples. The temples are interchangeable, and any of the styles can be furnished.

Your Wholesaler can supply you.

Fit Wellsworth Lenses in Wellsworth Mountings.

WELLSWORTH

TRADE Ⓐ MARK (Regd).

OPTICAL PRODUCTS.

Offices, No 39 Hatton Garden, E.C., LONDON

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE

PATENT L. W. ORTHOPS 167902.



THE L-W ORTHOPS OPHTHALMOSCOPE

This new instrument is entirely reflecting and eliminates most of the difficulties of ordinary ophthalmoscopy; with the minimum of practice, an excellent view of the fundus is obtained.

The instrument is worked by an ordinary small dry cell battery, measuring $3\frac{1}{4}'' \times 3''$.

It is an instrument that should be possessed by every sight testing optician who wishes to make ophthalmoscope examinations.

It can be obtained from any Wholesale Optical House, from whom a fully descriptive pamphlet can be had on application.

Manufactured by **GEORGE CULVER, Ltd., London, N.1**

A

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

J.&R.FLTD

Ophthalmic Publications.



We keep all the ophthalmic publications in regular demand in Stock.

Send us your enquiries for all kinds of equipment.

J. & R. FLEMING LTD.,

Telephone :
HOLBORN { 814 / 815
HOLBORN { 2788 / 2789 } Prescription Dept.

136-148 Clerkenwell Road,

LONDON, E.C. 1.

Telegrams :
"OTTICO." LONDON.

Branches with Prescription equipment :

WALTER BRAHAM & Co. Ltd.
6, Key Hill Drive,
BIRMINGHAM.
Phone: Central 2509
Telegrams: "Brahma."

37, WESTGATE STREET,
CARDIFF.
Phone: Cardiff 44
Telegrams: "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1085.
Telegrams: "Ottico."

8, SHUDEHILL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

J.&R.FLTD

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
The Rt. Hon. VISCOUNT HILL, L.C.C.

Upper Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Renter Warden
HARRY HYLTON-FOSTER. Esq., Past Master.

Director of Examinations
The Rt. Hon. SIR WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in May, 1922.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receiv them*

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

THE OPTICAL ENGINEER
AND JOURNAL OF OPTOMETRY

31st Year **Vol. LXII.** **No. 1,606**

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.
Publishing and Editorial Offices
123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, JAN. 6, 1921

The New Year.—Common to all men of good will, our New Year's wish is that the whole community may prosper. But more particularly we may add, our hope is for a brisk revival of trade in the optical industry, wherein we are jointly interested with our friends who read the paper. Sometimes it is said that the optical trade is the last to suffer in falling markets and the last to gain from a revival of trade. We do not believe that to be true, at least as regards the second part of the proposition. And as it is now generally agreed that we are entered on a period of improving business, we expect that the desire and the need for "better times" in optics is about to be justified.

* * *

Advertising.—The most obvious of the commonplaces of economic law is that "demand stimulates supply." To anyone engaged in trade however there is another aspect of the matter, evidently just as true in a more limited sense. This is that within limits, demand can be stimulated by supply. The purpose of a good salesman is to offer and recommend something more or "some-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

thing better" than what was in the mind of an intending purchaser. To offer attractively is the function of a well-dressed shop window also. The methods and intentions of window dressing are very varied, of course, and their merits very arguable. It may be said that insistence upon price and quality in the cheaper staple articles is not enough. A wise grocer is not content to feature in his window jars of plum and apple jam. He prefers to solicit interest through the various attractions of rarer and more refreshing condiments. So too in the case of spectacleware, a window packed with the lowest-priced grade of frames might be impressive enough, but not impressive in quite the right way. At best it could serve for a hint to all well-to-do purchasers, what to avoid. And at worst, for the uncritical or unthinking, it might tend to arouse prejudice against a well-made, highly finished steel frame, which is by no means a thing to be disparaged and cheapened. Unless done with an ulterior motive, not meant to be confessed, it seems bad policy for an ophthalmic optician to advertise the very cheap lines; for professional service is an essential in the prescribing and fitting of spectacles, which should not be undervalued.

* * *

Window Dressing.—"Many men many minds" is one of those profound aphorisms which point to the truth that shop window dressing is not a thing to be dogmatised about. The first and main point for consideration with respect to it is the class of people to whom a selling appeal is to be made. In large cities this depends of course on the location of the business. Price tickets are out of the question in some places, but practically essential in others. Other advertising attractions too, such as tablets or show cards and moving charts, have to be suited as well as may be to the mentality of an average passer-by; and that varies considerably according to the district where business is carried on. Indeed not so much importance attaches to the good taste of an optician himself as to the success with which he caters for the preferences of a paying clientele. The personal choice must be subordinated to the taste of consumers and the grade of their intelligence; as in cooking dinner for a party composed of bean-feasters or of bon viveurs.

* * *

An All-round Business.—The real difficulties or doubts begin where it is desired to cater equally for all classes—as in smaller towns of the provinces. There are some people of the well-to-do and well-educated sort, and many others of a lower social grade, with all of whom business and professional relations should be cultivated. What should be the advertising policy? That it should be a policy of liberal advertising will hardly be gainsaid; that is, if business is to be developed quickly and on commercially successful lines. If the shop window display includes meteorological apparatus, barometers and thermometers, besides optical instruments other than spectacles, sales can be increased and a desirable atmosphere of technical knowledge suggested. The unthinking part of the public looks on a pair of spectacles as a simple matter, not realising that it is a scientific instrument, in the same sense as a telescope or microscope, and needs the same sort of technical skill for its design, manufacture and adaptation to use. Such ignorance may be dispelled to some extent by suggestion or inference, by creating a scientific atmosphere in the optician's establishment, as well as by arguments on the subject of visual optics that are suited to the popular grasp. Then if a display of eyewear is not massed in the shop-window, or not exclusive, there is all the more reason for insisting on the claims of visual optics through newspaper advertisements.

* * *

Travelling Touts.—When a country town is descended on by one of those "great London specialists" of whom we have such bitter complaints, often not a single pair of spectacles is displayed outside the place he makes headquarters. The whole business is done by talking down to the level of uneducated, credulous people through bold newspaper advertisements. Some attention has been given by the leading organisations of retailers, and by individual correspondents of *The Optician*, to devising schemes of counter-advertising which have been put into operation with good effect against piratical intruders of the kind mentioned. On the other hand, cynical satisfaction has been expressed in private because of the harvest of misfits that accrues to locally established opticians, for re-testing, etc., after a visit from the "great specialist" has raised up a fresh crop of spectacle-wearers. We are not seeking to imply that every travelling tout is incompetent as a refractionist, though that is undoubtedly the rule. But whether on account of prevalent incompetency, or hasty fitting with cheap glasses of what have been called the reach-me-down sort, sure it is that the cult of travelling "specialism" brings

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

grist to a legitimate optician's mill.

* * *

Retailers' Announcements.—The question remains whether, avoiding all the travelling tradesman's ill-doings, local practitioners might not take one good leaf out of his book by adopting a bolder policy of newspaper advertising upon their own account. The visiting genius spends a considerable sum of money on his newspaper display, and he recoups himself and clears his profit with perhaps a week's work. His advertisements have brought immediate results, and he is content to forego one of the best recognised advantages of newspaper advertising, which is the establishment of a connection or building up goodwill. Admittedly, his work has brought new recruits into the ranks of spectacle-wearers; and his protestations have converted other people who were spectacle-wearers already to the belief that provision of suitable correcting glasses means something distinct from making a sale across the counter. Does it not follow that investing liberally in newspaper display could be be turned to the benefit, and indeed very greatly to the benefit of established sight-testing opticians? Striking advertisements, boldly displayed, are not necessarily misleading or in bad taste. And if a number of people seem only to be appealed to by what is exaggerated and vulgar—there is a multitude of others.

Insurance Societies and Opticians.

POSITION OF THE INSTIUTE OF OPHTHALMIC OPTICIANS AND THE BRITISH OPTICAL ASSOCIATION.

We have been favoured with copies of three circular letters, printed below, which are to be read in connection with the circular addressed to opticians by the National Insurance Beneficent Society, and reproduced in our columns (p. 276). These throw a very different light upon some of the statements made in that N.I.B.S. communication, which was circulated broadcast in the trade; and therefore it is important that the contradictions by Messrs. Cuff and Sutcliffe should have the fullest publicity.

Letter addressed to Approved Societies by Messrs. CUFF and SUTCLIFFE.

"To the Secretary of the .....

"Dear Sir,—In view of the number of Approved Societies who have undertaken to supply Optical Treatment to their Members, the Councils of the British Optical Association and the Institute of Ophthalmic Opticians have jointly prepared schemes to meet the position.

"The Councils of these bodies represent practically the whole of the Opticians qualified by Examination in this Country, and in preparing the Schemes have had two objects in view:—

"1. To provide a good service that will meet the requirement of all classes of insured Persons.

"2. To make the Scheme one that will attract the greatest possible number of Qualified Opticians, so that the choice of the Insured Person shall be as wide as possible.

"It must be remembered that the Optician supplies not only the Spectacle or Eyeglass, but service. This makes one uniform price impossible, if an effort is to be made to provide a service which practically all Qualified men will undertake. It is hoped to avoid the condition of affairs existing in the Medical and Pharmaceutical services, where a considerable section of Medical Men and Pharmacists are not willing to undertake the work. It has therefore been made as elastic as possible, and while providing for the supply of a good useful article at a low price, meets the requirements of those who wish to have goods of any other quality. Full particulars of the Schemes are enclosed, and any further details can be obtained from either of the Secretaries.

"We are, yours faithfully,

"J. HARCOMBE CUFF,

"Secretary of the Institute of Ophthalmic Opticians,

Staple Inn Buildings, W.C.1.

"J. H. SUTCLIFFE,

"Secretary of The British Optical Association,

Clifford's Inn, E.C.4.

"Joint Secretaries to the Schemes.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

"The SCHEMES REFERRED TO ARE

1. (*a*). Utility Glasses to be supplied as follows:—

"Sight Testing (when required) a fee of 5/-.

"A Steel Frame, with Spherical Lenses up to 8 Diopters, complete with cheap case, 5/6.

"With Sphero-Cylindrical, Prismatic, or Cataract Lenses, 5/- extra.

"(*b*). Other than the above, the Optician's usual prices to be charged, less fifteen per cent.

"2. The Optician's usual prices to be charged throughout, less fifteen per cent.

"1. The service to be rendered only by Opticians holding the Diplomas of the Spectaclemakers Company, or the British Optical Association, and the person doing the Sight Testing and/or Frame Fitting, shall sign any Certificate or Document required by the approved Society, with the addition of the initials or full description of his Membership of those bodies, or of the Institute of Ophthalmic Opticians. On the other hand the Societies undertake to send their Members only to Opticians holding these qualifications.

"2. The fee for Sight Testing to be paid wherever the work is done, whether glasses are required or not.

"3. The Optician shall be free to see the Patient by appointment.

"1. Each Patient to bring a written order, which he is to be requested not to produce until after the Sight Testing, &c., has been done.

"5. All accounts to be paid monthly.

"6. The arrangements to hold good for five years from 4th July, 1921."

Letters addressed by Mr. CUFF and Mr. SUTCLIFFE to members of the Institute of Ophthalmic Opticians and of the Spectaclemakers Company and the British Optical Association.

"Dear Sir,—In common with other opticians you have doubtless received a circular letter over the names of Messrs. Canter and Rockliff (representing the National Insurance Beneficent Society), containing references to statements and offers alleged to have been made to them by representatives of Optical Societies, and inviting you to add your name to an Optical Panel which they are endeavouring to form on the basis of terms set forth in this circular.

"Some of these statements are so grossly misleading, that it is my duty to put the Members and Qualified Opticians generally in possession of the true facts, in order that they may fully consider the position before committing themselves to a course of action which they might subsequently regret. For instance, the statement (attributed to the Council of the I.O.O.) that the minimum profit on which an optician works is 300 per cent. was never made, is entirely false, and could not be arrived at even by including all professional fees for sight-testing, fitting, etc., as profit on the bare materials supplied to the customer.

"Soon after the issue of the letter of July 1st (referred to in the first paragraph of the circular now under discussion), which offered Opticians in return for their services a price which would only admit of a bare margin of profit on glasses supplied, plus the contemptuous fee of 1/- for sight-testing and fitting, the Council of the I.O.O. called a conference of the members to ascertain their views on the proposals thus arbitrarily presented for their acceptance.

"Considerable discussion took place between the joint Councils of the I.O.O. and B.O.A., and a scale of suggested charges was drawn up, particulars of which were issued to their respective members.

"It was decided to issue this scale of charges to all Approved Societies, and also to the N.I.B.S.; but, however, before the circulars were actually issued, a protest was received from Messrs. Canter and Rockliff, who considered themselves entitled to preferential terms, which they held should be agreed upon before other Societies were approached.

"At a meeting of the I.O.O. Council (at which Mr. Sutcliffe was present, representing the B.O.A.) it was decided to defer the issue of the circulars pending an interview between Messrs. Canter and Rockliff and Messrs. Cuff and Sutcliffe. At this interview Mr. Canter definitely declined even to consider the terms suggested in the joint circular, and ultimately put forward as an alternative the terms quoted in the circular which has just been issued on behalf of the N.I.B.S.

Digitized by Google Original from THE OHIO STATE UNIVERSITY



Have They Been Working for You?

At the end of September, 1921, we made public an offer to supply Opticians free with the blocks for the advertisements which are here illustrated in quarter-size facsimile.

Since that time we have had a steady flow of demand for the series or part of the series. We understand that already the Opticians who took such prompt action have noticed a distinct benefit—in general business as well as in

Chance's CROOKES Glass

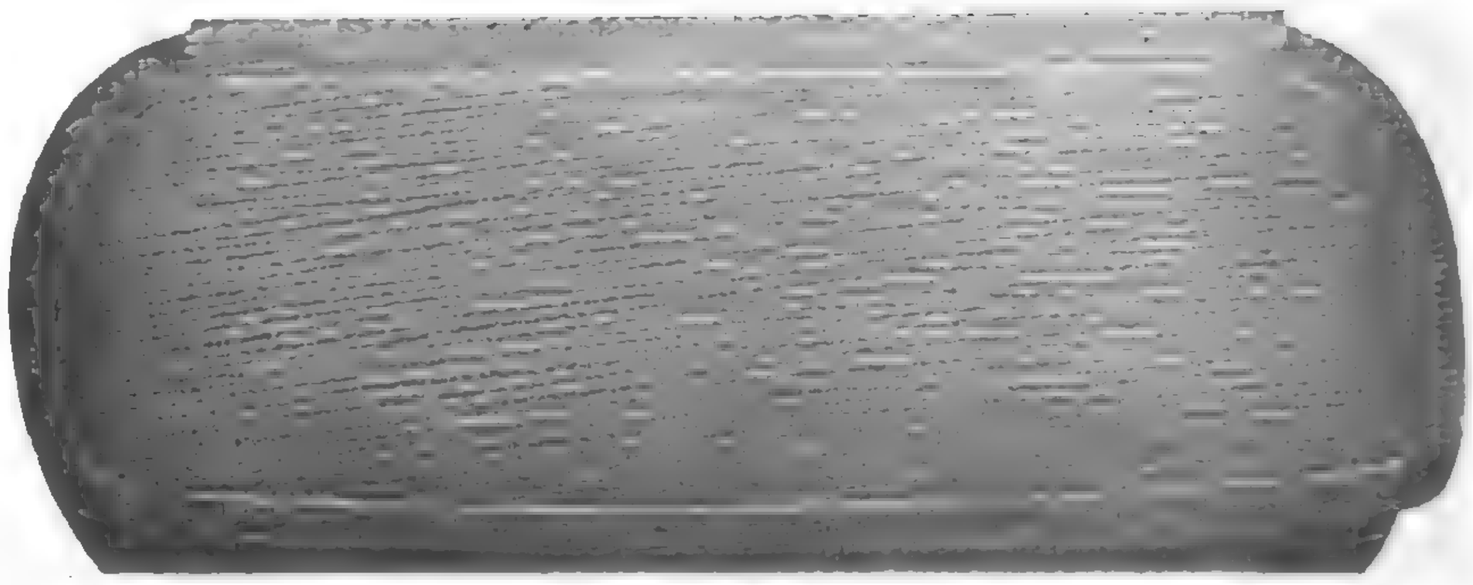
If you are thinking over your advertising policy for 1922, consider seriously this series of advertisements. Our offer to supply the blocks free is still open.

CHANCE BROS. & Co., Ltd.,
Glass Works,
SMETHWICK, BIRMINGHAM.



Digitized by Google
Original from THE OHIO STATE UNIVERSITY

"WERTEX"
WILLMOTTS'
LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.



11c 11c

First impressions are important, consequently your Testing Room is made attractive.

Lasting impressions are even more important, so complete a transaction by giving an attractive and lasting case.

Use "WERTEX" Cases.

Details and samples from your dealer or direct from the manufacturers.

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

ENGLAND.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"The inference that these terms were suggested by the B.O.A. and I.O.O. is absolutely untrue. Mr. Cuff, knowing the desire of his Council, that no possible avenue of negotiation which might lead to a satisfactory arrangement should be neglected, initialled them as a basis for negotiation to be laid before his Council. Mr. Sutcliffe, while refusing to initial them, laid them before the Council of the B.O.A.

"It is true that efforts were made to confine the service to Qualified Opticians, not to members of either negotiating body, but to all who had proved their ability by passing one or other of the examinations recognised by English Opticians. This was done in the interests of the Insured Persons who have the right to the best service obtainable.

"The terms suggested were subsequently considered by a Joint Conference of the B.O.A. and I.O.O. The Conference, considering that it could not recommend any Optician to accept such terms, and that no business man would look at such a proposition, gave instructions for the scale of charges previously agreed upon by the B.O.A. and I.O.O., to be issued forthwith to all Approved Societies.

"The Optician (in the circular in question) is now asked to give his professional services in testing sight and fitting a frame for a fee of 5s. He is to supply full particulars (such as would be required by a wholesale house to execute the order) to the N.I.B.S. and to have the option of supplying the glasses himself at cost price as per wholesale lists, or leaving them to be supplied by the N.I.B.S. The whole of his work is to be handed over for a fee of 5s. per case, and this to cover all expenses, including correspondence, postage, etc.

"Should you, in response to the Circular of the N.I.B.S., have already agreed to their offer, I consider that in view of the misleading and inaccurate statements which it contains you would be fully justified in withdrawing.

"Yours faithfully,

"J. HARCOMBE CUFF,

"Secretary."

"Dear Sir,—You may have received a printed circular from Messrs. Rockliffe and Canter, Secretaries of the 'N.I.B.S.' Only on one occasion, in a personal interview with Mr. Canter, have the B.O.A. been in communication with the 'N.I.B.S.,' and that particular interview has been completely misrepresented in the circular referred to. Nothing was initialled or agreed to by myself, or was any opinion expressed by myself other than that the B.O.A. were at total variance with the conditions laid down by the 'N.I.B.S.'

"As you are probably aware, neither the Committee or the Council of the B.O.A. approve, nor have they ever approved of these conditions.

"In response to the many letters received from the B.O.A. members on the question, the Executive Committee request, in view of the important negotiations now taking place directly, without any intermediaries, between the B.O.A., I.O.O. and the various approved Societies, that the members will help the Council by refraining from entering into any negotiations with the 'N.I.B.S.'

"The Council are naturally anxious to clear up a difficult situation, and therefore ask for loyalty on this point from their members.

"I am, yours truly,

"J. H. SUTCLIFFE.

"Secretary."

ELEMENTARY SCIENCE.

In connection with a prize competition organised by the 'University Correspondent,' the following amusing schoolboy mistakes in mathematics and science examinations were quoted:—

To find the area of the walls of a room you take the barometer and multiply by the height.

CO_2 is used for keeping people from dyeing and for distinguishing fires.

A straight line is one which being continually produced shall never end.

A hypotenuse is when two sides of a triangle are equal.

A centilitre is an insect with a hundred legs.

Isosceles triangles are used on charts to join up places with the same weather.

π is a Greek word meaning infinity or nowhere.

The larynx is the voice-box and shuts when we swallow it.

A compass tells a man where he ought to go; it always points to the sun.

Latitude tells you how hot you are and longitude tells you how cold you are.

Parallel straight lines are those which come together closer further off but do not meet.

Carbon dioxide is prepared by the action of hydraulic acid on mable.

A nonagon is a figure which has no sides.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Spectaclemakers Company

51st Examination, November 1921.

Paper on Sight Testing.

WITH ANSWERS BY LIONEL LAURANCE AND H. OSCAR WOOD.

1. Describe the lachrymal apparatus. What is the composition of the lachrymal secretion and what is its function?

The lachrymal secretion is a salty fluid whose index of refraction is the same as that of the cornea. Its function is to keep the front of the eye clear of dust, etc., and to facilitate movement of the lids over the front of the globe of the eye.

It is secreted by the lachrymal gland, which is situated in a depression of the orbit above the outer angle of the lids, and carried by movement of the lids over to the inner canthus where it collects in a hollow called the lacus which adjoins the caruncula. In each lid there is a minute orifice, termed the punctum, through which the secretion is drawn into a small canal, the two canals meet in the lachrymal sac which again is connected with the nasal duct through which the lachrymal secretion ultimately flows to be evaporated or combined with the nasal secretion. A great portion of the lachrymal secretion is evaporated from the front of the eye and overflow is prevented by the oily secretion of the meibomian glands situated in the margin of the lids.

Light entering the eye is first refracted by the layer of lachrymal moisture, this, however is thin, concentric with the cornea and, as stated, of the same refractive index.

2. Explain precisely what is meant by "spasm of accommodation." What optical defect does it simulate? State how you would recognise such a case and what measures you would adopt.

Spasm of accommodation is a term applied sometimes to cramp of the sphincter of the ciliary muscle and so would include latent hypermetropia. More often, and correctly, it is used to denote a condition of the eye where accommodation is exerted, to an extent beyond that which is needed for clear distant vision. It, therefore, causes a case of hypermetropia to resemble myopia or one of myopia to appear to be of higher degree than it really is.

Spasm of accommodation can be recognised by the history of discomfort which it causes, by the variable degree of vision, by the power of the lenses needed to produce normal vision, by the position of the near point or far point, by the extent of the available amplitude of accommodation.

The remedy consists of removal of the cause which is, generally, uncorrected astigmatism. Another cause is exophoria and comfort results from harmonising the action of accommodation and convergence by lenses or prisms. Some cases are, however, due to other than optical and muscular conditions and need medical attention.

3. Give a description of retinoscopy with a plane mirror. What lenses would just reverse the shadow movements, working at 1 meter, when the right eye needs for its optical correction a −2.0D. sph. and the left eye a +2.0D. sph.⊂+1.0D. cyl. 90°.

Light is received from a source, placed above the subject's head, on a plane mirror whence it is reflected directly into the subject's eye to be brought to an approximate focus at the retina, near to the posterior pole. The actual source is the lamp's image behind the mirror and if the observer is at 1M. from the subject, the actual source is at approximately 2M. Further, if the mirror be tilted so as to receive the light at an oblique angle, the actual source is inclined to the eye and sends the light into it obliquely.

Light received on the subject's fundus is reflected back to emerge from the pupil in parallel beams if the eye is emmetropic, in convergent pencils in myopia, in divergent pencils in hypermetropia, they being always directed to the far point of the eye under test, in hypermetropia this being negative and in emmetropia infinite. The observer looks through a perforation in the mirror and receives the return light which, to him, appears as a disc of light more or less completely filling the pupil, and throughout the test this pupillary disc of light, called the reflex, surrounded by the margin of the iris is the point of observation and, therefore, conjugate to the observer's retina.

The object of the test is to locate the subject's far point and since this is impossible if infinite or negative and difficult to pick up even if positive, the test resolves itself into bringing the far point to the observer's eye, that is making the eye artificially myopic. 1D. if the test is made at 1M. or 2D. if at 50cm. and so on. The reflex being seen, the mirror is tilted, thus changing the direction of the entering light, so that the illuminated fundus area is changed, and that part which

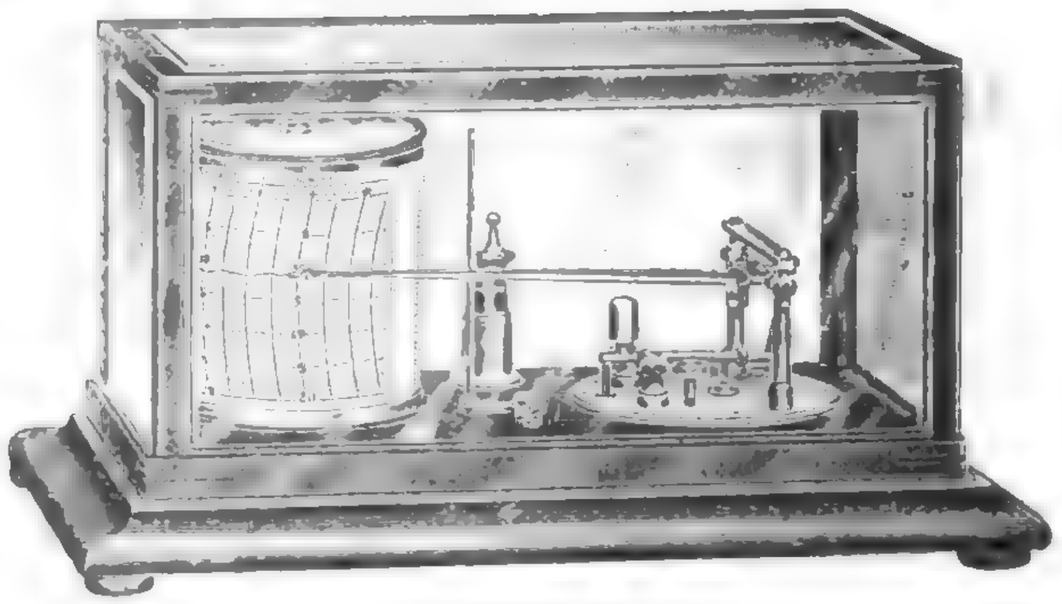
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

A POPULAR BAROGRAPH
of S. & M. Quality.

This first-class Recording Barometer combines an unusually high degree of accuracy with very moderate price. The Vacuum movement is concealed beneath the base plate, the whole construction being typically "S & M." in quality and reliability. Available for prompt delivery, either in oak or mahogany case with glass cover, eight day clock and one year's supply of ink and charts.

The world-wide reputation of "S. & M." Scientific Instruments entails no penalty to the Retailer. Every sale shows a handsome profit.

Write for full particulars, terms and general booklet.



S. & M. No. 2318.

SHORT & MASON, Ltd., Aneroid Works, Walthamstow, London, E.17

J. WHEELER,
55, St. John Street, Oxford.
Wholesale Optician and Manufacturer's Agent.

The cheapest House for B.S.O. Astigs $\frac{1}{16}$ to $\frac{1}{4}$, F/M/Frames, Cables and S/S, $\frac{1}{16}$ and $\frac{1}{4}$, recently purchased from the bank.

We also hold large stocks of Edged and Unedged Lenses; price list on application.

For Wholesale Only.

RADIUM COMPOUND
SELF-LUMINOUS.

Highest Possible Efficiency, Durability and Value.

As supplied to H.M. Government, &c.
Guaranteed to pass N.P.L. requirements.
All Grades in stock, from 15/- per gram.
RADIUM SALTS TESTED AND CERTIFIED.

F. HARRISON GLEW THE RADIUM LABORATORY,

156, Clapham Road, London, S.W.9

WE ARE

All obliged to consider carefully what we pay for our goods now-a-days, and even a small saving, if often repeated is worth while, provided quality is there.

Quality is our first consideration, and no matter how high the price paid, it is not possible to obtain better quality than W.O.W.

You want proof? Then send a trial Rx order to W.O.W.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY: DUDDEN HILL LANE, N.W.10

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

OPTICAL MANUFACTURERS LTD.,

(Incorporating Wheway Optical Co., Ltd.)

WAR TIME CONTRACTORS TO THE ARMY SPECTACLE DEPOT.

Manufacture for the Wholesale Trade:—

Gold and Gold Filled Spectacle and Astig Frames.

Gold and Gold Filled Rimless Spectacle and Finger Piece Mountings

Gold and Gold Filled Monocles and Reading Glasses.

Solid Nickel Spectacle and Astig Frames.

Solid Nickel Pillar Frames and Folding Gauze Spectacles.

Steel Spectacle Frames.

Spectacle Sides and Jobbing Materials, in all Metals.

Extract from a letter received by a large Wholesale House:

"We have sold Wheways spectacles for a long time now, and as they have given us such all round satisfaction we have every confidence in them and desire to stock all their products where possible."

All these Articles are of English Manufacture

Works at VYSE STREET and GEM BUILDINGS, HOCKLEY HILL, BIRMINGHAM.

London Office: 55, HATTON GARDEN. E.C.1.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

was previously bright becomes dark or dull;* the area which has become dark owing to removal of the illumination is termed the shadow. The shadow movement is always, with a plane mirror, in the same direction as that of the mirror's projected light and is so seen by the observer except when the eye is myopic such that its far point lies anterior to the observer, in which case the shadow movement seems to be reversed because the observer is then regarding a real image of the fundus light and shadow play.

When the far point of the observed eye is situated in the pupillary (principal) plane of the observer's eye, these two are conjugates and there is no apparent shadow movement. So that the correcting lens is determined by putting up that lens which neutralises the shadow movement and adding to it −1D. to compensate for the artificial 1D. of myopia existing when neutralisation results.

A lens which will reverse the direction of the original apparent movement of the shadow is .25D. stronger than the neutraliser of that movement, therefore, for the case given in the question, the reversing lenses are

R.E. −1.25D.

L.E. +3.25D. vertically and +1.25D. horizontally.

4. What is the meter angle? Has it a constant value, or on what does its value depend? What single prism of ordinary notation would cause a similar deviation of the eyes to a one meter angle convergence?

The meter angle is that angle formed, by each visual axis and the median line, when the two eyes are converged to a point situated 1M. from both centres of rotation. It is, therefore, that angle whose sine is half the interpupillary distance.

Since the interpupillary distance is a variable quantity with different people so the M.A. has a variable value which is greater as the P.D. is larger. Its value is $1^{\circ}45'$ for a P.D. of 60mm. and $1^{\circ}50'$ for one of 61mm. Expressed in prism diopters its value is 3^{Δ} to 3.25^{Δ} so that a single 6^{Δ} or 6.50^{Δ} base out would cause the eyes to converge 1M.A., that is a prism of about 7° principal angle.

5. What is myopia? What are its causes and what different forms do you recognise?

Myopia is the condition of the eyes in which the conjugate of ∞ is anterior to the retina or conversely the conjugate of the retina is within ∞.

It is due to a length of eye too great for the refracting power or conversely to a refracting power too great for the length of globe. The first is called axial, the second is refractive and the ordinary myopic eye is one that has grown too long while the refraction is approximately normal. It is caused by excessive use of the eyes in childhood under unfavourable conditions pertaining to the eyes themselves, or to the locality, the surroundings or the illumination where near work is carried on.

Ordinary acquired myopia may be classified as of low, medium or high degree of say, over 10D. If the M commences fairly late in life, say, at 14 or so and has not developed much at maturity, it is sometimes termed school M.

Another type is that which is present at, or shortly after, birth; it may reach a very high degree and should be regarded as a pathological condition, as should also the ordinary type if it is high or if it is a cause of reduced visual acuity to even the smallest degree.

6. What is meant by the terms "amplitude of accommodation" and "punctum proximum?" The p.p. of a hypermetrope is at 20 cm. and amplitude of accommodation 8D. How much hypermetropia has he and what, approximately, is his age?

The amplitude of accommodation is the total quantity possessed and is expressed by the difference between the dioptric power of the eye when accommodation is, respectively, fully exerted and fully relaxed.

The punctum proximum is the nearest point of distinct vision, that is the conjugate focus of the retina when all the accommodation is in action. If P is the near point and R the far point, the amplitude.

$$A = P - R.$$

Given an amplitude of 8D. and a p.p. of 20 cm. = 5D. we have

$$8 = 5 - R.$$

therefore $R = 5 - 8 = -3D.$

There is 3D. hypermetropia and the age, when the amplitude is 8D., is approximately 27 or 28.

7. Transpose into the best sphero-cylindrical form and into toroidal form with a base curve of +6.0D., the following lenses

(a) $+4.25$ *sph.* $\bigcirc -3.0$ *cyl.* 180°.
(b) $+8.5$ *sph.* $\bigcirc +1.0$ *cyl.* 180°.
(c) -1.25 *sph.* $\bigcirc -1.25$ *cyl.* 90°.
(d) -8.0 *sph.* $\bigcirc +2.0$ *cyl.* 45°.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

(*a*) This is in its best ordinary form.

(*b*) +9.5 sph.⊃−1 cyl. ax. 90°.

(*c*) −2.5 sph.⊃+1.25 cyl. ax. 180°.

(*d*) This is in its best ordinary form.

As torics to a +6D. base

(*a*)	−4.75D. sph.
+6D. C. ax. 180°⊃+9D. C. ax. 90°.	
(*b*)	+2.5D. sph.
+6D. C. ax. 90°⊃+7D. C. ax. 180°.	
(*c*)	−8.5D. sph.
+6D. C. ax. 90°⊃+7.25D. C. ax. 180°	
(*d*)	−14D. sph.
+6D. C. ax. 135°⊃+8D. C. ax. 45°	

8. A myope of 15D. has his crystalline lens removed. What is the optical effect of such a procedure, and what lens would he require to enable him to read at 33 cm.?

The removal of the crystalline lens produces, in an originally emmetropic eye, a high degree of hypermetropia which can be corrected by a + lens of some 11D. placed about 15mm. in advance of the cornea. If the eye were originally hypermetropic the needed correcting lens would be stronger and if myopic it would be weaker. Therefore the removal of the crystalline from an eye myopic 15D. has the effect of reducing the degree of myopia, but it also removes any possibility of accommodating.

The optical condition expressed in terms of the correcting lens 15 mm. from the cornea will be approximately

$$+ 11 + \left(\frac{-15}{2}\right) = + 3.5 \text{ D}$$

And for reading at 33 cm. there would be required

$$+3.5 + 3 = +6.5\text{D}.$$

9. What measurements would you require for making a spectacle frame? What difference would you make in a frame for reading glasses and one for shooting glasses?

The measurements required are

(1) Interpupillary distance.

(2) Temple width.

(3) Height of bridge.

(4) Width of bridge.

(5) Projection of bridge.

(6) Length of sides.

(7) Size of eye,

and sometimes

Depth of bridge.

Contour of bridge.

Slope of bridge.

Angle of sides.

Many of these are not necessary for a presbyope's reading glasses. But compared with distance glasses. No. 1 is less, No. 3 is greater, No. 7 is smaller, while Nos. 4 and 5 are not wanted. The frame should be angled out from above.

Shooting glasses on the other hand should have No. 3 less than usual, No. 7 greater, and the frame should be slightly angled out from below.

10. Describe the perimeter. How is it used and for what purposes?

The perimeter consists essentially of an arc of half a circle, which can be rotated and which is numbered in degrees from the middle to each extremity. In the centre of curvature of the arc there is an eye rest supported on a vertical upright. The arc is also supported on a vertical upright to which is attached a scale and pointer which indicates the meridian in which the arc is situated. The middle point or zero of the arc is marked by an aperture or a mirror which serves to fix the line of vision of an eye which is placed immediately above the eye rest and which is therefore in the centre of curvature of the arc.

The perimeter is used for measuring angles in connection with the eye as for instance, angle kappa, the angle of a squint, the angular field of vision, or the angular space of a scotoma.

Angle κ is determined on the arc when the image of a flame is seen in the centre of the pupil, while the visual axis of that eye is directed to zero of the arc.

The angle of a squint is indicated on the arc when the image of a flame is seen in the middle of the pupil when the other eye is directed to a distant point directly in front of and in line with the zero mark and the eye rest, The value of kappa must be added to the angular measurement found in convergent squint and deducted in divergent squint. A vertical squint would be similarly measured when the arc is vertical.

The angular field of vision in any meridian, above and below the horizontal plane or to the nasal and temporal sides of the vertical plane can be measured by finding the extreme distances from the zero point of the arc at which a small white fixation disc can be seen while the eye under test is directed to the arc zero and the other eye is occluded. The usual and, anyhow, the most essential directions are in and out in the horizontal plane and up and down in the vertical plane.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

W.H.T.

W.H.T.

THE HALL-MARK OF

Efficiency Service. Supplies.

WALTER H. THOMPSON

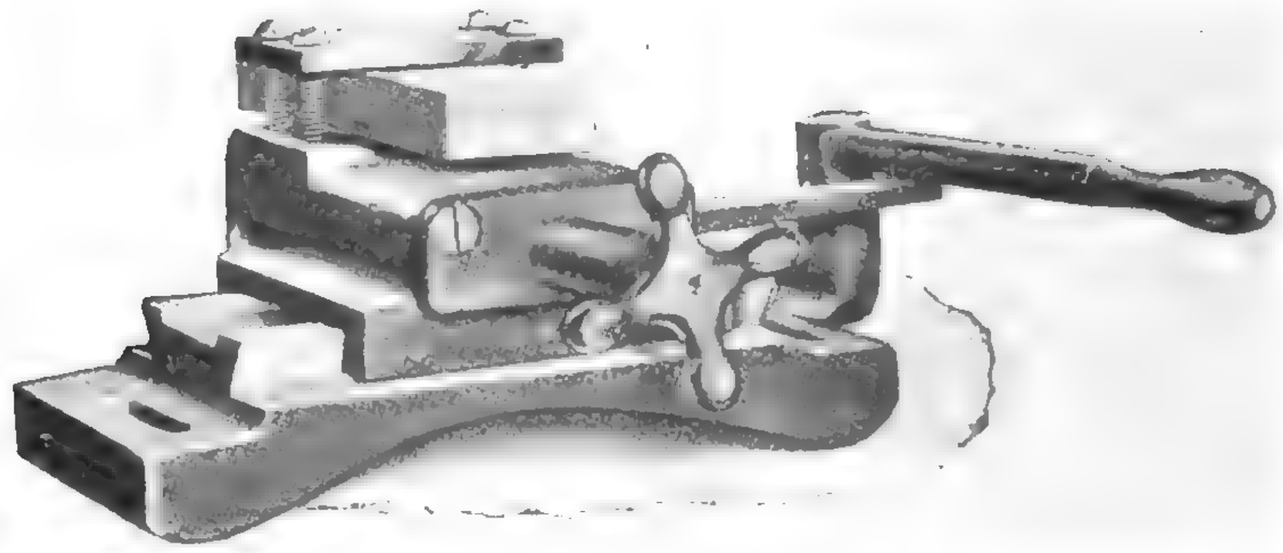
66 HATTON GARDEN, LONDON, E.C. 1.

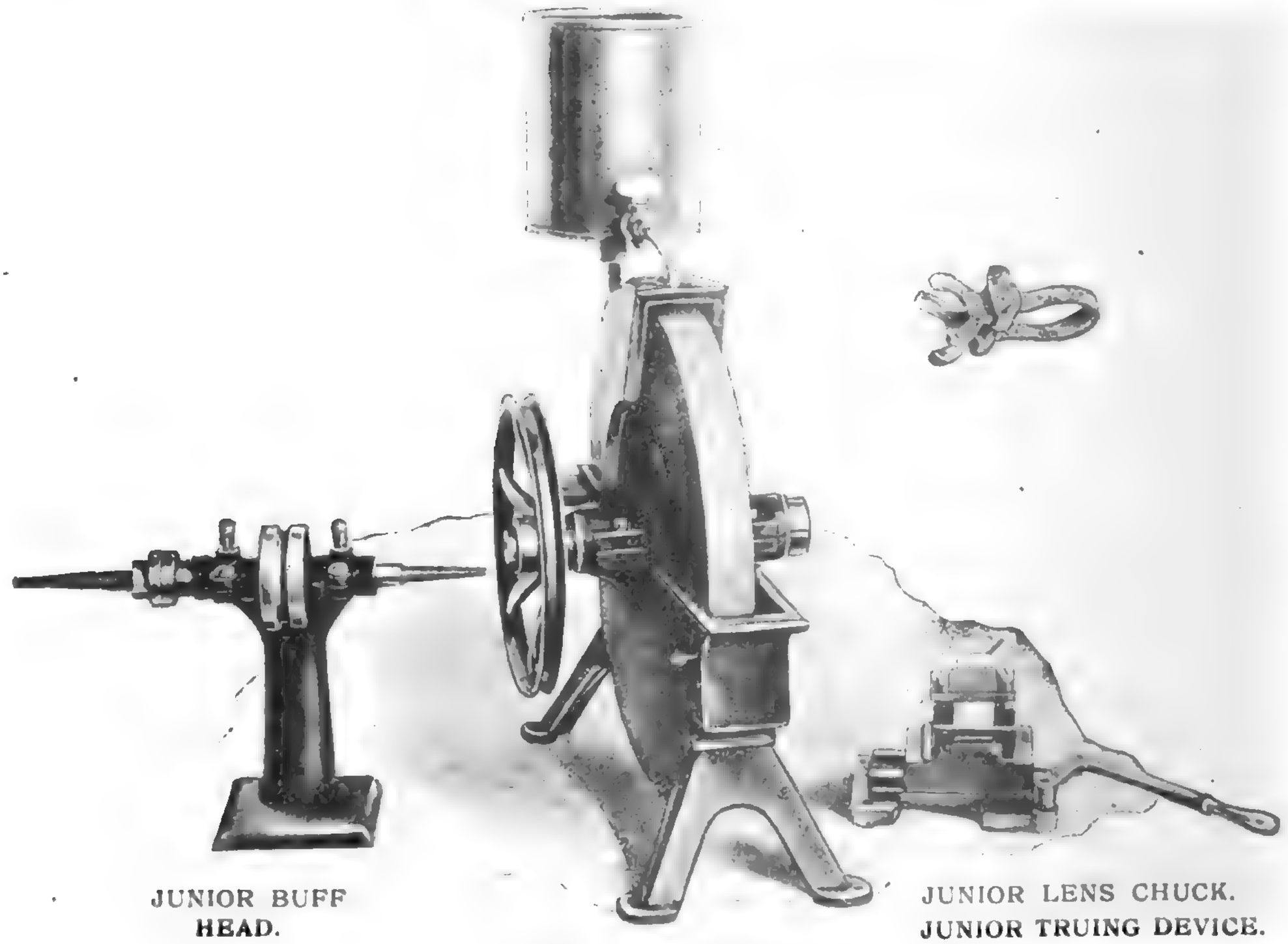
Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Senior Grindstone Truing Device.





JUNIOR BUFF HEAD.

JUNIOR HAND STONE.

JUNIOR LENS CHUCK.
JUNIOR TRUING DEVICE.

These illustrations shew some of the items included in the range of "CONSOL" Machinery Products.

Every machinery need of the modern optician is catered for, and a full Catalogue will be sent on application to your regular Optical Supply House or direct to.

THE GENERAL OPTICAL Co. (E. T. & F. W. Cornwell),

31 & 32, ELY PLACE, HOLBORN, LONDON, E.C. 1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

EYESIGHT AND HEALTH.

By ELISABETH HYATT-WOOLF.

There are few people who can to-day confess to feeling absolutely well. A number of minor complaints seem to bar the way to perfect health. That constant little ailing with which we are all familiar is a greater trial than a real illness.

No doubt it will come as a great surprise to the average man or woman to be told that some slight failing of eyesight is probably the cause of that insidious small trouble, which at times makes life so difficult to endure. Oculists who give time to investigating the health of their patients find out some astonishing facts.

The following stories come from a busy Harley Street specialist. He does not look upon his patients as machines who only need visional corrections and glasses. He endeavours to get behind the nervous temperament. If he meets with opposition to wearing glasses he tries persuasion, and, failing this, allows the patient to buy his own experience.

His attention, he says, was first drawn to the effect of glasses on nerves by an American, who consulted him about slight inflammation of one eye. He noticed that this man was wearing glasses, and on examining them he realised that he had a very slight astigmatism, one which we do not always bother to correct in this country. Test lenses to discover such a minor fault are, in fact, not usually supplied in England. In answer to the inquiry why he wore glasses, the American replied:—

"My doctor over on the other side gave them to me. Before I wore them I was irritable and miserable. Now I have forgotten what nerves are. Of course, I can see perfectly without them."

On another occasion a very neurotic clergyman, who on account of health had resigned his living, called on this oculist. He opposed everything he was told, declared his sight was perfect, and went off with a prescription for glasses which the doctor felt certain he would never have made up. To his great surprise, however, four months afterwards, the parson turned up accompanied by his wife. She was the patient this time, and eventually told how, after much trouble, she had persuaded her husband to try the glasses, with the most miraculous results. His condition of health had so much improved that he had gone back to the Church and was doing better work than ever.

A case of perhaps greater interest is one concerned with digestion. The patient, a lady, was given glasses to wear always. The oculist did not ask her any health questions, because she was not in a confidential frame of mind. Two years afterwards she appeared again, and opened the conversation with: "My sight seems excellent, but I feel sure I need a change in my glasses. You see, when I came to you last time I was suffering very badly from nervous dyspepsia. From the first week I wore your glasses until last week I have not had any trouble at all. The dyspepsia has begun again, so I am now sure my eyes are the cause."

Wearing glasses may even cure the temper.

A small boy was taken to Harley Street for attention to his eyes. He was given glasses to wear always, and for two years nothing more was heard of him. Then the mother decided on a fresh consultation in case he needed change. In the course of a little talk she asked the oculist whether it was possible that wearing glasses could have cured the boy's temper. "When I first brought him to you," she said, "he had a dreadful temper. Now he is hardly ever irritable."

There are many more stories like these, and they all prove that the slightest error in vision may be causing much unhappiness. So if you have some tiresome little complaint, or nerves, or suffer from neuralgia, consult somebody about your eyes, but most of all somebody who is sympathetic.

* From the 'Daily Express.'

The Optical Society.

The next meeting of the above Society will be held at the Imperial College on Thursday, 12th January, at 7.30 p.m. The following papers will be presented:—"The Manufacture of Optical Glass," by Dr. C. J. Peddle, M.B.E.; "The Barr and Stroud 100-ft. Self-contained Base Rangefinder," by Dr. James W. French; "The Optical Three Apertures Problem," by T. Smith, M.A. A limited number of advance proofs of the paper by Dr. Peddle and that by Mr. Smith will be available before the meeting. Application for copies should be made to the Hon. Secretary, at 12, Oppidans Road, N.W.3. As Mr. Smith's paper will be taken as read, written contributions to the discussion which will appear in the "Transactions" are invited.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

DUPAUL, YOUNG OPTICAL CO.,

SOUTHBRIDGE, MASS., U.S.A.

The "ONLIWON" GOLD FILLED INNER RIM ZYLO FRAME.



"For Perfection of Detail"

Close personal supervision by men of long experience in the manufacture of optical goods insures the highest standards of workmanship.

This enables us to produce an inner rim frame which relieves you of the annoyance of numerous repair jobs, and gives complete satisfaction to your customers.

Those who use our ONLIWON frames frequently mention their superior exactness of eyesize. This means a saving of time and expense when fitting lenses.

The regular weight frame is supplied with regular, cylinder or zylonite covered bridge, and with any of the varieties of temples.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. Telephone: CENTRAL 7241

Digitized by Google Original from THE OHIO STATE UNIVERSITY

"BISHOP EYEGLASS CHAINS"

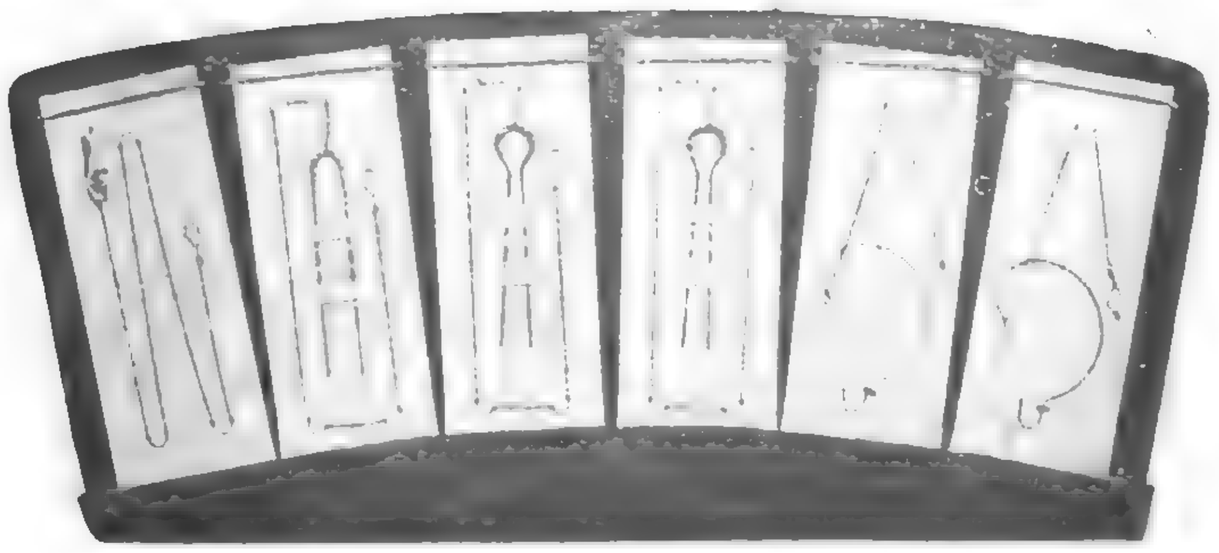
In Gold and Gold Filled

ALSO

SILK EYEGLASS & MONOCLE RIBBONS

are well known to the OPTICAL TRADE and have always been known to give satisfaction. Quality and Finish are evident in all goods of Bishop manufacture and the Bishop trade mark on all chain cards and boxes is your guarantee of absolutely dependancy.

Avoid substitutes, let "BISHOP CHAINS" be your standard of Quality.



THE BISHOP COMPANY,
North Attleboro, Mass.,
U.S.A.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

Advertised Qualifications in Sight-Testing.

Sir,—By omission of the name of the personage referred to in Mr. Braham's letter last week (p. 292), it is ensured that no injury is done to the feelings of anybody in particular. At the same time it seems just possible that, to the unknowing, this vagueness may imply a reflection on some person or persons that is quite unwarranted.

Of the various schemes of examination that have been, or are about to be set on foot, I am only interested in that of the Worshipful Company of Spectaclemakers. And I submit to you, sir, that in fairness to the great body of diplomates of the S.M.C., I should be allowed to say that everyone, from the very earliest of those thus qualified, has satisfied a professional examining board of independent scientific men. My statement could be easily corroborated by enquiry in the proper quarters, and I challenge contradiction of it.

There were indeed a very few honorary diplomas granted in the early days of the Company's work, but their recipients, being honest men, did not advertise them as implying a certificate of technical qualification vouched for by the Company's examiners. And I believe that without exception, all names advertised by the Spectaclemakers Company, in the lists issued by them through the Optical Almanac and otherwise, are those of men or women who have satisfied the examiners as aforesaid. I feel certain that no one is trading under any false pretence, upon the ground of holding an honorary Diploma of the Spectaclemakers Company, and think that your correspondent's suggestion should be emphatically repudiated as implying (possibly) the existence of some such person.

S.M.C.

Salaried Refractionists.

Sir,—With regard to the proposals suggested to opticians for becoming connected with the National Health Insurance, would it be practicable for opticians to receive a fixed salary from the Insurance Committee for their services and fitting of visual aids, similarly to school clinics, and for the Insurance Committee to pay the wholesale people direct for visual aids supplied to the optician for his Insurance patrons? The optician to be supplied with duplicate prescription forms for obtaining his patron's requirements from the wholesale houses; the duplicate prescription form to be retained by the wholesale people to be presented to the Insurance Committee for payment at arranged intervals.

This arrangement would enable those opticians who desire to uplift their status to give up their shop and continue their services in a professional manner from rooms or their private residence. Also their hours of actual refracting could be concentrated, thus avoid that "waiting for patrons all day," as many opticians could complete a week's refracting in 3 days were it concentrated.

Non-Diploma Holder.

Retail Charges for Ophthalmic Ware.

Sir,—It is with some surprise that I observe a statement attributed to the Institute of Ophthalmic Opticians (p. 276, Dec. 23rd), has gone uncorrected by representatives of that important body. I refer to the suggestion that 300 per cent. is a minimum profit to be made on the sight-testing optician's wares. A consideration of extreme cases will prove that any flat rate of percentage of profit must be unreasonable.

If the cheapest of glazed steel spectacles is taken to cost a shilling, evidently 300 per cent. is little enough to charge for sight-testing, measurement, clerical work and other establishment charges. It is of course too little. A doctor does not charge his patient so much per cent. upon the cost of the drug that he supplies.

But suppose a wealthy customer who is a hypermetrope with some astigmatism and also presbyopic. Expense not being material, say we give him a toric best-form lens in Crookes glass with kryptok addition, mounted in gold frame. Here in round numbers, two guineas may be our minimum to be added for sight-testing, etc.; but surely not 300 per cent. on cost of article supplied.

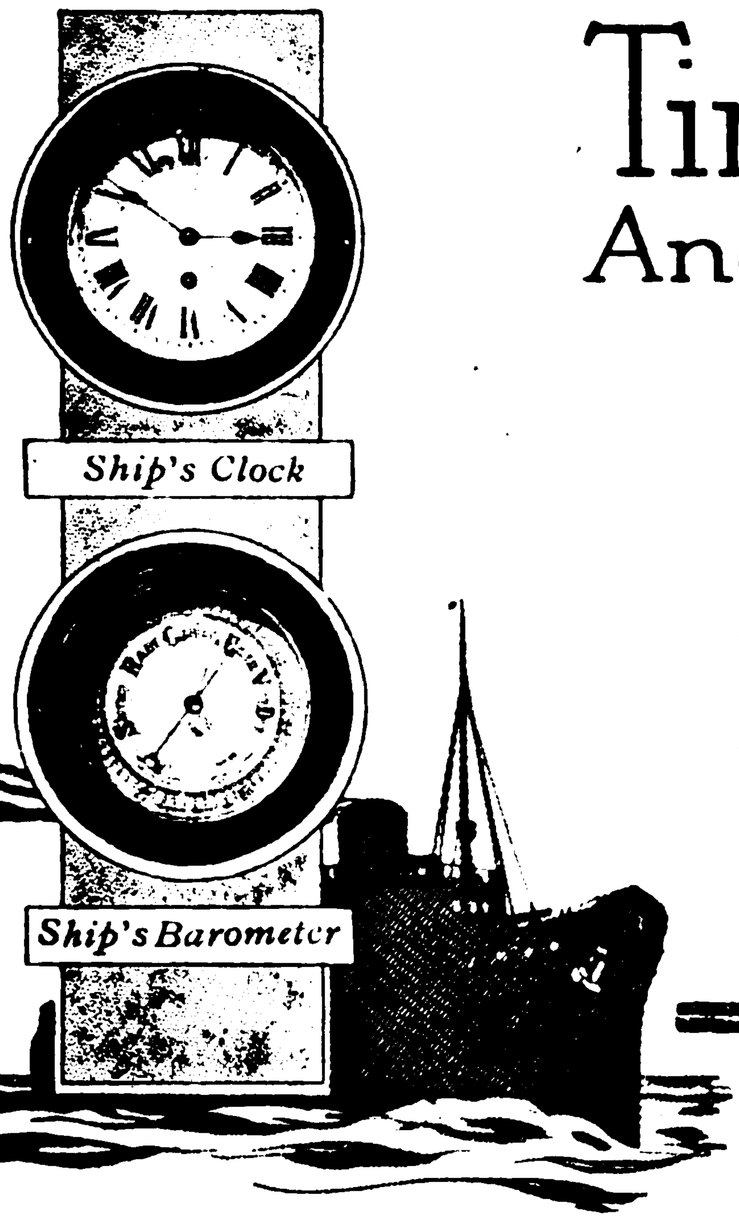
The same correction in a steel frame, with ordinary sphero-cylindrical glass and a cemented wafer, is a very different proposition. The calculation of payment for services

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

T. A. R. & Co.

"THE ALL BRITISH HOUSE."

Over 2,000 Designs in Aneroid Barometers.



Time and Tide
And Ship's Instruments

T.A.REYNOLDS & CO
40-1-2 PERCIVAL STREET,
LONDON E.C.1



Steam-pipe Thermometer *Hydrometer*

Telegrams—
"THERBAROME. LONDON."

Telephone—
339 CITY.

Showrooms and Offices at above address.

If you are a Retailer and need ORIGINAL LINES in Barometers, Clocks and Thermometers, write us, and although we will not supply you direct, we will put you in touch with the Nearest Wholesale House.

WHOLESALE AND SHIPPING TRADE ONLY.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY.

South Kensington, S.W.7.

Department of

OPTICAL ENGINEERING AND APPLIED OPTICS.

The following courses of weekly lectures will be continued during the Spring Session, 1922:

1. General Optics (Elementary), Professor Cheshire, commencing Wednesday, January 18th, at 4 p.m.

2. Advanced Optics, Professor Cheshire and Mr. L. C. Martin, commencing Monday, January 23rd, at 12 o'clock.

3. Optical Designing and Computing, Professor Conrady, commencing Tuesday, January 17th, at 10 a.m.

4. Advanced Designing and Computing Professor Conrady, commencing Wednesday, January 18th, at 10 a.m.

5. Workshop and Testing Room Methods, Professor Conrady, commencing Wednesday, January 18th, at 2 p.m.

6. Construction Theory and Use of Optical Measuring Instruments, Mr. L. C. Martin, commencing Friday, January 20th, at 12 o'clock.

7. Mechanical Drawing and Elementary Strength of Materials, Professor Pollard, commencing Friday, January 20th, at 2 p.m.

8. Mechanical Design of Instruments, Professor Pollard, commencing Wednesday, January 18th, at 12 o'clock.

The following Special Courses will also be given:—

1. Mechanical Design of the Common Microscope, Professor Pollard, commencing on Wednesday, January 18th, at 6.30 p.m.

2. The Spectroscope and some of its Modern Applications, by Professor A. Fowler, F.R.S. (Professor of Astrophysics, Imperial College) on Mondays, from 6.30 to 7.30 p.m., commencing on January 30th, 1922.

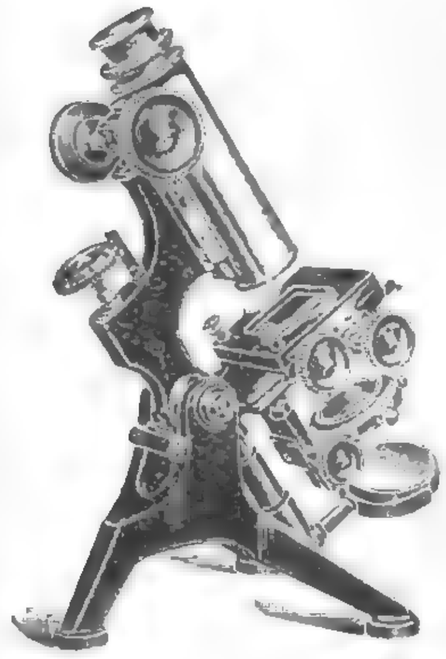
3. Photometry, Mr. L. C. Martin, commencing on Friday, May 5th, at 5 p.m.

For further particulars and for admission tickets apply to Registrar at the above address.

SELL WATSONS' BRITISH-MADE

MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,

313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1837.

Scientific Instrument Makers.

MICROSCOPES of all kinds manufactured at our own works.

REPAIRS to Prismatic and other Binoculars etc., promptly executed.

H. H. SHARLAND (H. KEMP), 9 & 10, THAVIES INN, HOLBORN CIRCUS, LONDON, E.C.

Tel.: Holborn 4840. Established 1860.

Every Description of Ophthalmic Supplies. All Requirements of the up-to-date Sight Testing Optician. Good Special Lines at keenly Competitive Prices.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

as a percentage on cost of goods is radically wrong, in my opinion.

AN OLD OPTICIAN.

[The suggestion imputed to the Institute of Ophthalmic Opticians in a circular which was distributed to the trade and subsequently reproduced in our columns (see p. 276) has been emphatically repudiated by the Secretary of that body, Mr. J. Harcombe Cuff, as is recorded this week on p. 296.—Ed.]

Exhibition of Apparatus at the Imperial College.

As we go to press, an exhibition is being held (on Wednesday and Thursday, of this week) at the Imperial College of Science and Technology, South Kensington, where a fine collection of optical, electrical and other physical apparatus has been brought together. The display which is organised by the Physical Society and the Optical Society, is contributed to by over fifty manufacturers of instruments.

Among the exhibitors best known in the optical industry were Messrs. Chas. Baker, 244, High Holborn, W.C. (photomicrographic apparatus, stereoscopic binocular and other microscopes); R. & J. Beck, Ltd. (microscopes and accessories); Bellingham & Stanley, Ltd. (polarimeters, refractometers, saccharimeter); George Culver, Ltd., Pentonville, N. (the Laurance-Wood Orthops ophthalmoscope, Sutcliffe self-recording microkeratometer, Bi-Liptic solid bi-focal lenses, "The Rapid" curved lens demonstrator); J. H. Dallmeyer, Ltd. (photographic lenses and apparatus); F. Davidson & Co., 29, Great Portland Street, W. ("Davon" patent microtelescope and super-microscope appliances, improved microscope lamp); Edison-Swan, Electric Co., Ltd., Ponder's End (pointolite apparatus); Foster Instrument Company, Letchworth (automatic temperature controller, pyrometers); F. Harrison Glew, 156, Clapham Road, S.W. (materials and apparatus for demonstrating radio-activity); Adam Hilger, Ltd. (apparatus for study of the physical properties of glass); Henry Hughes & Son, Ltd., 59, Fenchurch Street, E.C. (nautical and mathematical instruments, clockwork for recording instruments); Negretti & Zambra, 38, Holborn Viaduct, E.C. (thermometric and meteorological apparatus, capillary steel tube); Newton & Co., 72, Wigmore Street, W. (science lanterns and accessories); W. Ottway & Co., Ealing, (equatorial and other telescopes, levels, theodolites); A. W. Penrose & Co., Ltd. (direct vision spectroscopes, spectroscopic camera, metal mirrors); Rheinberg & Co. (graticules); Taylor, Taylor & Hobson, Ltd. (measuring instruments); H. Tinsley & Co. South Norwood, S.E. (disappearing filament pyrometers, Dr. C. V. Drysdale's A.C. potentiometer, tuning fork stroboscope); W. Watson & Sons, Ltd., 313, High Holborn, W.C. (microscopes, photographic and photo-micrographic apparatus, astronomical and portable telescopes, prism and Galilean binoculars); Watson & Sons (Electro Medical), Ltd., 43, Parker Street, Kingsway (radiographic outfit).

Several addresses were given in the course of the exhibition. Professor F. J. Cheshire, C.B.E., taking the chair, Mr. Harrison Glew lectured on "Redium": its Application in Peace and War." The Astronomer Royal, Sir Frank Dyson, F.R.S., discussed the employment of coarse wire gratings. Dr. F. L. Hopwood gave a demonstration of experiments which were described in the transactions of the Optical Society, Vol. 23, No. 2.

Spectaclemakers Company.

We are notified from the offices of the Spectaclemakers Company that it is hoped to have all Diplomas that were gained at the recent examination signed ready for issuance by the end of this month.

Courses of Lectures in Optics at the Imperial College of Science.

A detailed announcement appears elsewhere this week as to the courses of weekly lectures on optical subjects at the Imperial College of Science and Technology, South Kensington. Among the lecturers are Professor F. J. Cheshire, C.B.E., Mr. L. C. Martin, Prof. Conrady, Prof. Pollard and Prof. A. Fowler, F.R.S. Any further particulars, and tickets of admission, may be obtained on application to the Registrar at the College.

Mr. G. Braham writes complaining that we deleted a name from his letter published last week (p. 292), and desires it to be made clear that he was not afraid of publishing the name of the gentleman he referred to. Mr. Braham points out that we printed his own name in a similar connection previously (p. 187); but there is this clear distinction, that our correspondent raised the issue himself by stating in his letter on p. 173 (Nov. 4th), that he passed an examination in 1879.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Light and Chemical Energy.*

By Professor PIERRE WEISS, University of Strasbourg.

If we observe the waves which traverse the surface of a sheet of water we perceive at once that there is a definite distance maintained between each two consecutive waves; this represents the length of the wave. With our crossed analyser and polariser we can perform one of the many experiments which enable us to determine the wave-length of light. In the rectangle of red light thrown upon the screen we observe a series of parallel bands which are alternately light and dark.

We have divided the luminous movement into two portions. In the luminous band farthest to the right, the two luminous movements arrive at the same time and reinforce each other. In the adjacent dark band one is half a wave-length behind the other, in consequence of which they counteract and destroy each other; a little farther in the second luminous band the retardation is twice as great, which gives us an entire wave and the movements once more added together, producing the full strength of light, then in the following band there is a retardation of 1½ wave-lengths so that again the crest and trough of the waves meet and neutralise each other, and so on. By calculations based upon this phenomenon the wave-length of the red light at the far end of the spectrum has been found to be eight ten-thousandths of a millimeter.

Let us repeat this experiment performing it at the same time with red light and with green light, which we obtain by filtering white light through coloured screens. Now let us place the two phenomena side by side—we observe that the red bands are farther apart than the green ones and perceive that the wave-length of green light is shorter than that of red light. At the most highly refractive end of the spectrum the wave-length is only four ten-thousandths of a millimeter. In the ultra-violet the length is still shorter while it is considerably longer in infra-red. The longest wave-lengths of light which have been measured are .008 millimeter.

Let us suppose now that the temperature of a body is gradually raised. At a point slightly above 400° C. the rays emitted will begin to make an impression upon the retina of our eye and the body will appear dark red, passing later through cherry red and orange until it reaches an increasingly dazzling white . . . The proportion of the various rays alters and the higher the temperature becomes the richer the light is, both absolutely and relatively in violet and ultra-violet rays. If we reverse the experiment by cooling the body we gradually reach the red light and, finally, this becomes too feeble to impress the retina—beyond this point we have the infra-red rays whose wave-length is the longest.

Now let us imagine a closed metal box in which a vacuum has been produced and which is then heated from the outside. The internal walls will become incandescent as the temperature increases and will emit light which will traverse the box at the prodigious velocity at which light travels, *i.e.*, 300,000 km. per second, until the light from one wall reaches the opposite wall where it will be reflected or absorbed. We perceive, therefore, that it is not precisely correct to say that this box contains *nothing*; as a matter of fact it contains radiations moving in every direction. And these radiations consist of a mixture of lights of all the colours and of all the wave-lengths in proportions depending upon the temperature of the box at any given moment. If the temperature is lower than 500° C. there will be practically no visible rays present, but only infra-red rays.

Now the same process of reasoning holds true if we imagine the box instead of containing a vacuum to contain a solid liquid or gaseous transparent medium and if we cool it to the ordinary temperature of the air which surrounds us. In other words this very room in which we are assembled represents such a box. It is evident, therefore, that we are as a matter of fact, immersed in infra-red rays which come from every direction to strike and penetrate our bodies. All the work which we do, every operation we perform in our daily lives takes place in a bath of infra-red rays. When we consider this evident fact it seems curious enough that no one has ever thought of assigning to this agent a rôle of importance in the phenomena which surround us.

Let us now examine the problem from a chemical point of view. Anyone familiar with chemical laboratories knows the important part played by heat in chemical processes. Whether he is concerned with one of the thousand operations of qualitative or quantitative analysis, whether he is dissolving a metal in

[Continued from page 249.]

* From an address at the Congress of the Union of the Industrial Societies of France.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

After Stock-taking—

At the end of 1921 doubtless many of our customers took stock, and are now taking advantage of the information then collected and classified.

Do not let this opportunity slip, but arrange now for any shortages which your stock-taking may have revealed to be made up with

1st Quality British Lenses.

Our Stock, Plant and Organisation are at your service to assist you in doing this.

We wish all our friends a

Very Happy and Prosperous New Year

and look forward to the continuance during 1922 of those pleasant business relations which we have had with them in the past.

UNITED KINGDOM OPTICAL CO., LTD.,

(Wholesale and Export Only.)

MILL HILL, LONDON, N.W.7

Digitized by Google

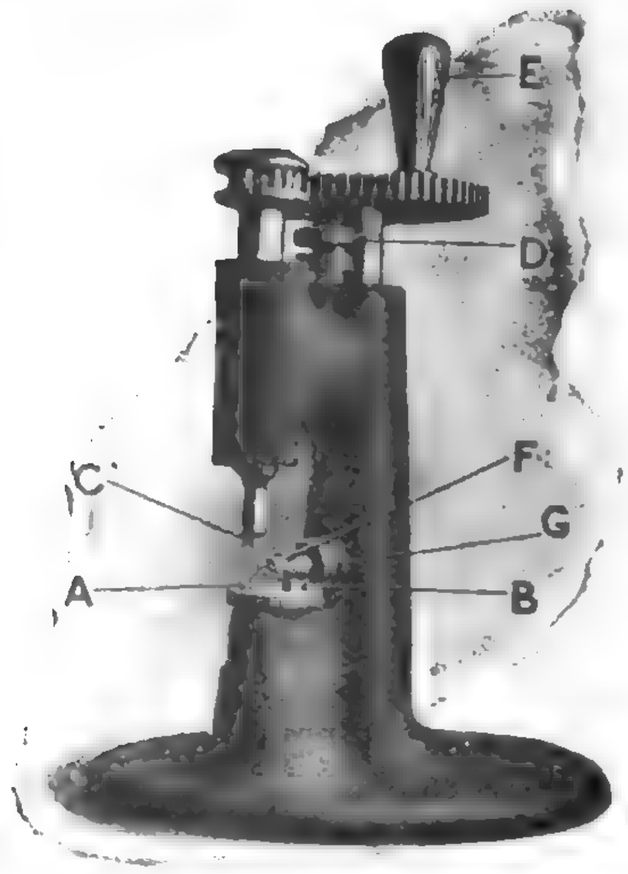
Original from THE OHIO STATE UNIVERSITY

OPTICAL MACHINERY



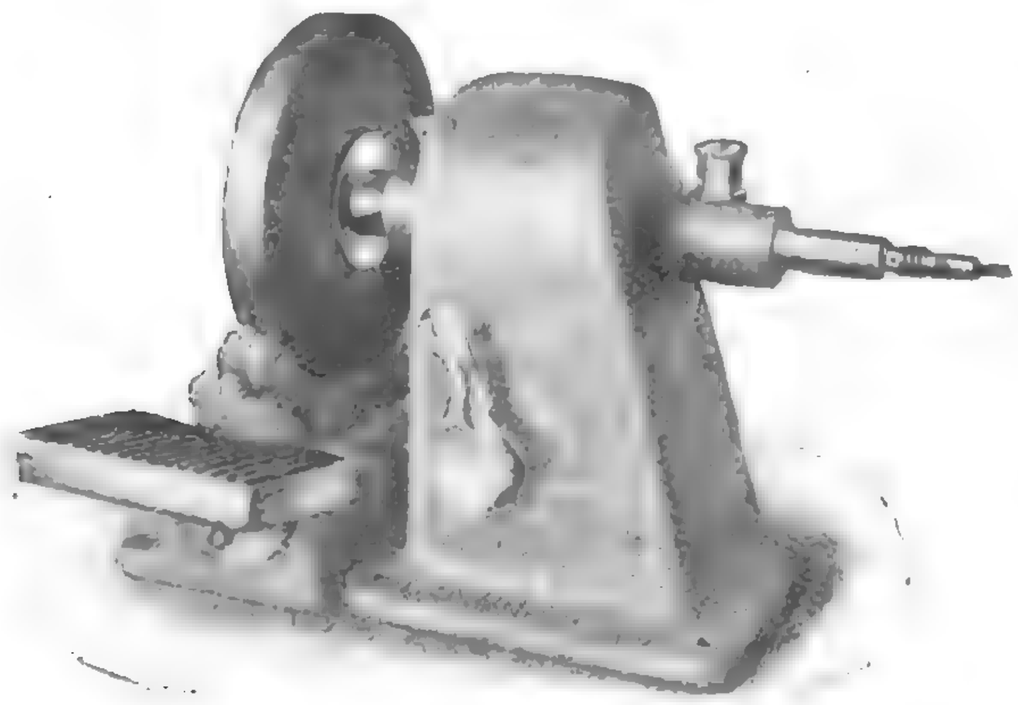
POWER EDGING MACHINE.

Measurements of Stone:—10 ins. Diameter by 1 in. Face. Complete with fast and loose pulleys.



HAND DRILLING MACHINE.

Complete with best quality Diamond Drill. Full instructions sent with each.



FINISHING MACHINE.

Illustration shows machine complete with Alundum wheel on one end of Spindle and a screw-finishing Machine on the other side. The following extra tools can be fitted:—Carborundum Wheel for edging lenses; V edge Stone for milling; Tapered Screw for fitting brushes and felt wheels for polishing frames; Diamond Drill; Solder Iron, etc.

Write for particulars. ***Delivery per Return.***

JOHN BAIRD,
Manufacturing Optician,

"HERALD" OPTICAL WORKS,
68 & 70, MITCHELL ST., GLASGOW.

Telegrams: "SPECTACLES, GLASGOW." ***Telephone: CENTRAL 541.***

Digitized by Google Original from THE OHIO STATE UNIVERSITY

an acid, obtaining a precipitate or observing a colour, the chemist nearly always heats the test tube in which the reaction takes place. A whole series of operations is conducted, by heating the bodies subjected to the experiment by means of a gas burner while they are traversing a tube.

Early chemists made much use of furnaces fed by wood charcoal; nowadays, we have coke furnaces or electric furnaces, such as those, for example, with which Moissan made his brilliant discoveries. It is a well-known fact that a rise of temperature accelerates chemical reactions, whereas a fall of temperature retards them. At the temperature of liquid air reactions which are violent at ordinary temperatures--such, for example, as that of sulphuric acid upon potassium--are benumbed. But it is an accepted fact that heat is due to molecular motion and that chemical combinations and decompositions result from the violent shocks produced between molecules which come in contact with each other because of this motion. But there are some difficulties in the way of accepting this theory.

When there is a rise of temperature to 10° C. above the ordinary, the kinetic force of thermic agitation is augmented by a thirtieth and the velocity of the molecules by a fifteenth of their value. But there are a great many chemical reactions whose velocity increases much more rapidly--when it is even doubled, for example, by a rise of ten degrees. It seems strange that there should be such a disproportion between cause and effect.

There is another difficulty which is perhaps even more serious. Let us suppose the case of a small quantity of the vapour of hydriodic acid (HI) in a closed container, say a liter. Let us now raise the temperature to such a point as to cause the vapour to break up into its component elements, hydrogen and iodine. This dissociation will take place at a certain rate of velocity.

(To be Concluded).

The Light Sense in Myopes.

Dr. L. Bierens de Haan (quoted in the 'American Journal of Ophthalmology') has examined with four different objects, the vision, the perception circle, the perception extent, the optical extension sense and "point vision," with different illuminations and different contrasts. He examined normal persons and 60 myopes. He proved that the vision is rather regularly disturbed in myopes; and that with diminishing illumination and contrast, vision diminished to a greater extent than in emmetropes. But for the optical extension sense, the influence of illumination and contrast appeared less distinct. He drew conclusions regarding the position of the cones and eventual distension of the retina.

In the course of discussion: Dr. Waardenburg referred to the investigations of Steiger, whose conclusions have been accepted by Swiss ophthalmologists, that the so-called school myopia does not exist; but that the different results of the refraction are a necessary consequence of the combination of optical constants, determined by heredity (chiefly refraction power of the cornea and axis length of the eye). He knows only one criticism, a posthumous one of Straub. For him, an uncertain point has always been the distension symptoms at the posterior pole of the eye in slight degrees of myopia. It would be important to investigate as to whether two groups exist, those with and those without distension symptoms, and whether school myopes belong to the first. He asked whether Dr. de Haan had made this distinction. He was astonished that de Haan's conclusions had been that in general there was a diminution of the light sense in myopia, though it was not caused by distension and displacement of the nervous elements. The question then was by what, and did de Haan know anything about the light sense in hypermetropes.

Dr. de Haan replied that he examined only eleven persons in each group so that he did not feel able to decide positively between hereditary, acquired or pathological disturbance. He would not care to give an explanation of the light sense disturbances found.

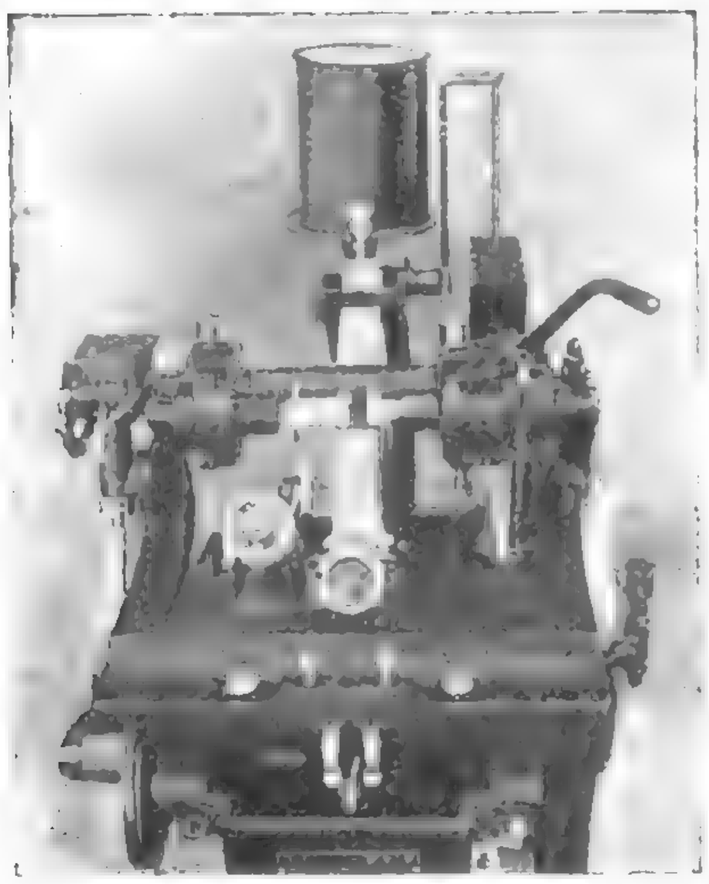
Mr. John Herbert Parsons, D.Sc., F.R.C.S., F.R.S., ophthalmic surgeon, has been accorded the honour of knighthood.

New Company.

W. E. Symmons & Son, Ltd.—Private company.—Capital £4,000 in £1 shares. To take over the buisness of W. E. Symmons trading as "W. E. Symmons and Son," at 27, Edgbaston Street, Birmingham, and to carry on the business of manufacturers and factors of and dealers in lamps, photographic accessories, general hardware, lamp chimneys, spectacles, binoculars, telescopes, microscopes, cameras, scientific, optical and other instruments, lenses, reflectors, crystals and glasses, etc. Registered office: 27, Edgbaston Street, Birmingham.

NOTICE TO ADVERTISERS.—Change of Copy, for displayed advertisements, must reach us at latest by first post on Tuesday morning preceding publication; and for Cover on Monday. Failing any such notification of change, the last previous copy will be re-inserted.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



The *Stoco* No. 66-A
Rx Rimless Edge Grinder.

The Hand of Iron with The Touch of Velvet.

If the ***Stoco*** No. 66-A Rimless Edge Grinder had nothing more than its battleship construction, its great capacity and its ability to take an overload day in and day out and deliver indefinitely it still would be a good edge grinder.

But it is the oscillating balanced carriage that most distinguishes the ***Stoco*** No. 66-A Rimless Edge Grinder. The oscillation of the carriage eliminates chipping and the balance places at the instant command of the operator a direct pressure that may be varied from the tender touch required for a single lens to the weight necessary for the heavy run.

That means micrometer precision and the underlying sturdiness of construction means that the machine will be just as precise in after years as the day it was installed.

Manufactured by

THE STANDARD OPTICAL Co.,

GENEVA, N.Y., U.S.A.

Makers of High Grade Frames, Mountings, Lenses and Optical Machinery.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

What builds up your Rx turnover if not the character of your service and the quality of the eyeglasses you supply?

Your training and experience enable you correctly to diagnose eye-defects and prescribe properly adjusted glasses. This ability is naturally the corner-stone in the structure of your business.

But hardly less important is the accurate interpretation of your Prescriptions. Indeed, without full and absolute confidence in the firm handling this part of your work, your personal skill is likely to be nullified entirely.

You can place complete trust in the L.O.C. Service.

As far as human foresight, technical skill, and mechanical facilities can ensure it, we have provided against every untoward emergency likely to impair our customers' interests.

Telephone: CENTRAL 4572

Telegrams: Locoptical Kincross London.

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris. France.

Also at—2, Str-Bursei, Bucharest, Roumania.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

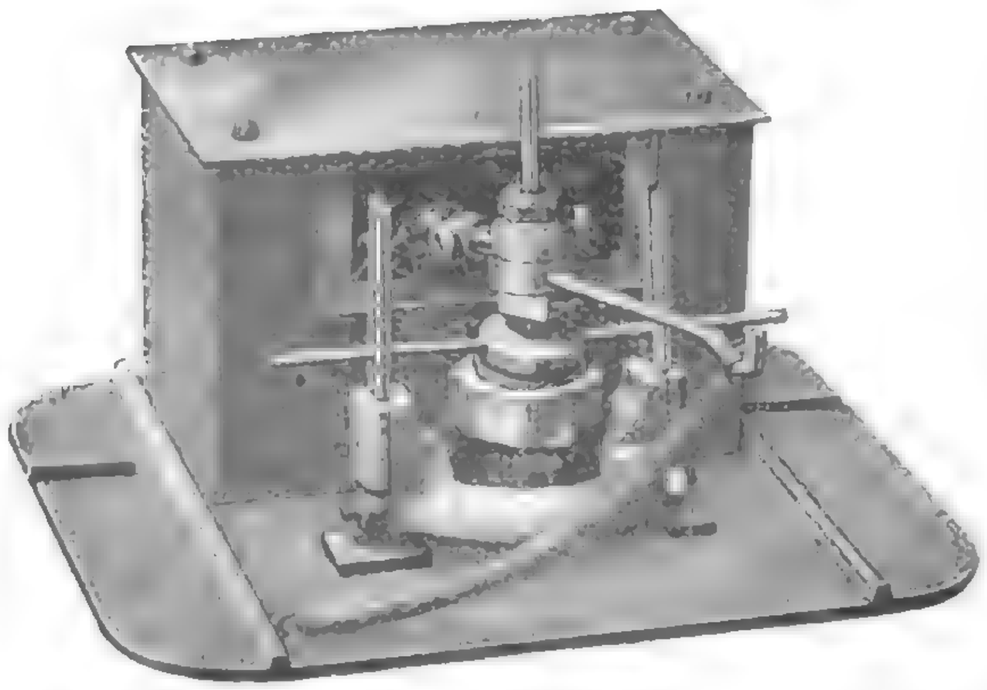
"SOMCO"

AUTO-SURFACING MACHINE.

PATENTED IN
GREAT BRITAIN
U.S.A.
FRANCE
GERMANY.

LONDON
MADE.

Ask for Quotations.



Requires Only 1/6 H.P.

TOOLS
GAUGES
SURFACING
SHOP EQUIPMENT
OPTICAL MACHINERY & INSTRUMENT REPAIRS.

SURGICAL & OPTICAL MFG., Co.,
22, Union Road,
Clapham, London, S.W.4

WE WISH YOU ALL A PROSPEROUS NEW YEAR.

NOW! WHAT ARE YOU DOING TO MAKE IT PROSPEROUS?

ARE YOU QUITE SATISFIED WITH YOUR

RX SERVICE

OR THE PRICE AND QUALITY OF YOUR

STOCK SUPPLIES?

IF NOT WE CAN OFFER YOU A

QUICK AND ACCURATE SERVICE AT REASONABLE PRICES

SEND YOUR ORDERS NOW TO

Telephone:
HOLBORN 1890
(Private Exchange).

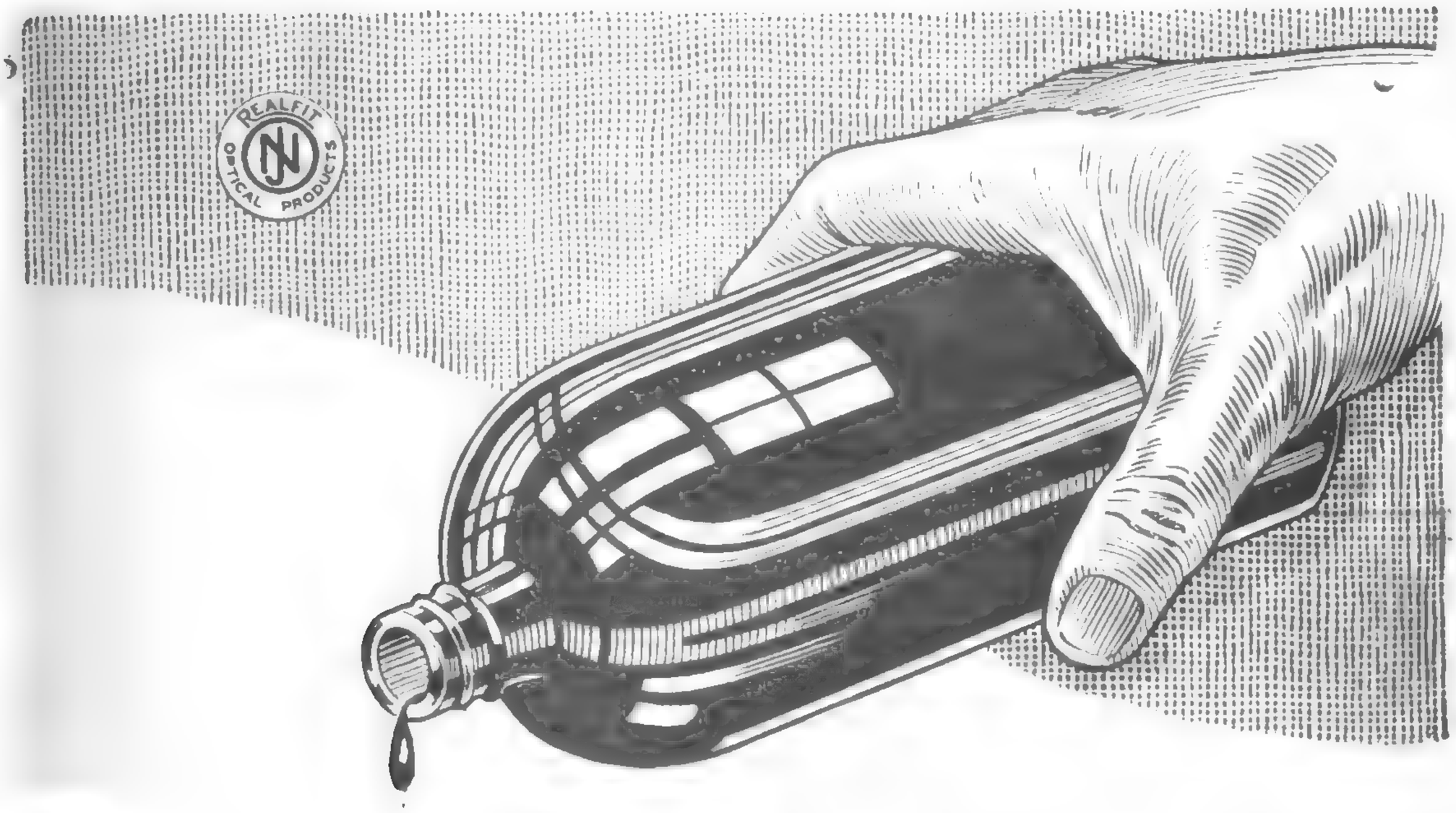
KIRK BROTHERS
WHOLESALE & MANUFACTURING OPTICIANS

Telegrams:
KIRBROREX, HOLB.
LONDON.

36, GRAY'S INN ROAD, LONDON, W.C.1

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY



The hand of Time applies the acid test to merchandise and men. Many are found wanting; they fall by the wayside. A few possess that element which men call QUALITY. Time cannot efface their greatness.

REALFIT Finger Piece Frames and Mountings are Quality products. Whether you buy to-day or next month, *always* you can be certain of their uniform high standard—of their comfort, beauty and enduring strength.

The best material is used throughout. Every part of the mounting is constructed with great precision.

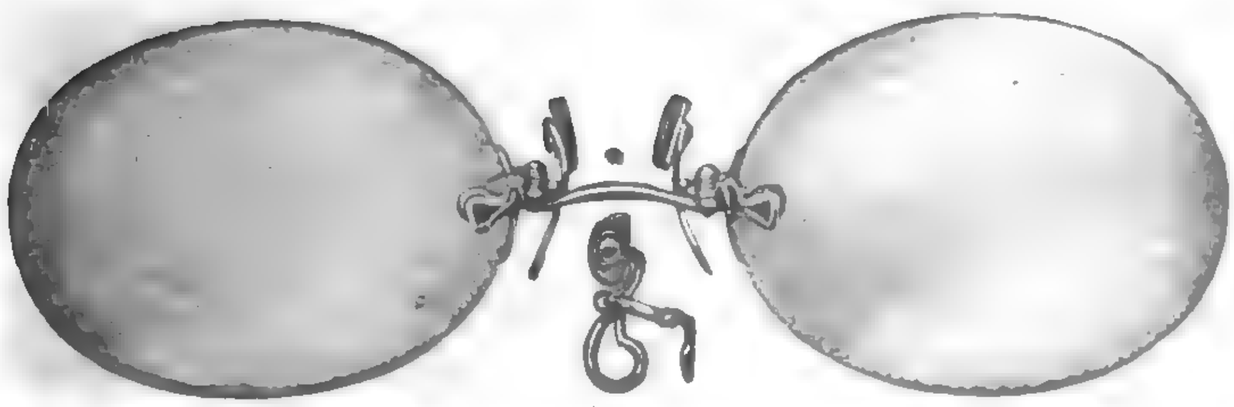
No less than five inspections testify to the care exercised that no REALFIT should leave our factory unless it is absolutely perfect.



REALFIT

Finger Piece

Mountings and Frames.



Made in all standard sizes with a complete assortment of Guards. If your Wholesaler cannot supply you, write us.

NEW JERSEY OPTICAL Co.,
Newark, N.J. . . . . U.S.A.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



OPTICAL BLOCKS

To illustrate all features of Optical Service. Write for Lists.

Chemists' Design Service,
12, Humberstone Gate, Leicester,

PERCY S. DE SAULLES.

Manufacturer of . . .

MICROSCOPICAL GLASS SLIDES.

Micro Cover Glasses, Glass Cells and Cavity Slips, etc.

The Platts, Amblecote, Stourbridge.

C. BAKER 244 HIGH HOLBORN LONDON

Do You Handle Kodaks?
The "Metron" Plate Adapters, if stocked, will mean a large Increase of Business.

Estab. 1765 **PARTICULARS AND TERMS ON APPLICATION**

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
C. H. DYMOND. M.I.Mech.E., F.I.C.P.A

W. P. THOMPSON & CO.,

12, CHURCH STREET, LIVERPOOL.

Chartered Patent Agents.

H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

T. WHEELER,

Scientific Instrument Manufacturer,

Specialities: POCKET SURVEYING and AERONAUTICAL ANEROIDS.

217, GOSWELL ROAD, LONDON, E.C. 1

ESTABLISHED 1878 **TELEPHONE CITY 419**

SPECTACLES & EYEGLASSES,

Their Forms, Mounting and Proper Adjustment by R. J. PHILLIPS, M.D.

Fourth edition revised with 58 illustrations.

Price 6s. 6d. Post Free 7s.

THE HATTON PRESS, Ltd., 125, Fleet Street, London, E.C.4

Worshipful Company of Spectaclemakers.

Tuition for the Company's Examinations in Optics and Sight Testing at **THE SCHOOL OF OPTICS Ltd.**

2, GUILFORD PLACE, LONDON, W.C. 1

Particulars on application.

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,

DANDURAND BLDG., MONTREAL.

Cable "Optical" A.B.C. Code 5th. Edition.

Telephone **JAMES B. SLY,** Central 10280.
9 & 10, EDWARD ST., WARDOUR ST. LONDON, W. 1

To S.M.C., B.O.A. & I.O.O. DIPLOMA HOLDERS

Oak frames and modelled gold Arms for the diplomas The Arms of the S.M.C., City of London, and devices of the I.O.O., B.O.A. and Ph. Society in water colours, and framed dark oak, with descriptive engraved plate affixed, 27/6 each. Packed and put on rail.



Printed & Embossed Optical Stationery.
Steel Dies for use of Diploma Holders.
Electros of Coat of Arms & Optical Devices.
Engraved Seals, Prescription Forms, Signs, etc.
Price List on application.

Electro No. 12 Price 3/6

F. BARKER & SON, LTD.

SUNDIAL HOUSE,
12, Clerkenwell Road, LONDON, E.C. 1

Registe
Trade Mark
Estab. 1848

MANUFACTURERS OF ALL CLASSES OF

SCIENTIFIC AND OPTICAL GOODS.

MANUFACTURERS OF

Aneroid Barometers, Compasses, Drawing, Mining, Surveying & Scientific Instruments of Every Description.

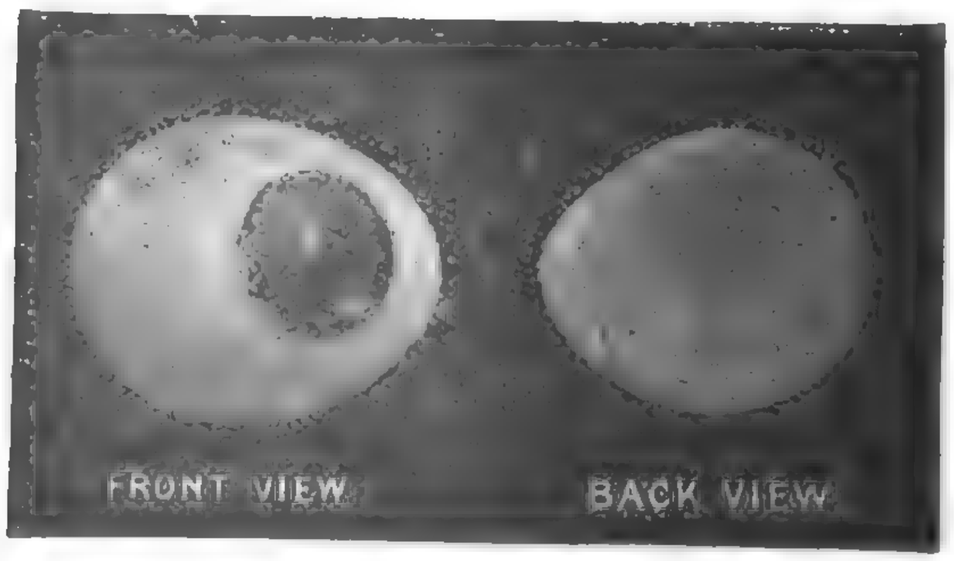
Illustrated and Descriptive Catalogue Post Free to any part of the World. Illustrated Booklet upon Sundials, Barometers and Compasses, Post Free. LISTS FREE.

Correspondence Invited. Bankers' and Trade References.

CLINICAL THERMOMETERS A SPECIALITY

SNELLEN'S IMPROVED ARTIFICIAL EYES

PACHE & SON, 75, Station St., Birmingham.



MAKERS TO THE PRINCIPAL HOSPITALS.
Selections sent to Surgeons. Also Makers of the ordinary Shell Eye.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

DEPENDABILITY



One of the strongest reasons why far-seeing opticians have been specifying Shur-on gold filled spectacle frames is because of their downright dependability.

They have fully appreciated the fact that a thoroughly dependable frame was one of the surest ways of winning the confidence, future custom and goodwill of their patrons.

Since 1864—dependability along with "Quality Beyond Question" have been two of the cardinal principles upon which Shur-on frames have been built.

Be critical - say "SHUR-ON" to your wholesaler.

Shur-on Optical Co.,

Rochester, N.Y., U.S.A.

Shur-on Products

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Re DIOPTRICS, LTD. (In Liquidation). The liquidators still have for sale a large quantity of frames and mountings and uncut lenses for which enquiries are solicited. Particulars from Dutton Armstrong & Co., Clarence Chambers, 4, Piccadilly, Manchester, or E. Lawton & Son, 14, Brown Street, Manchester.

FOR SALE. Half-plate stand camera, mahogany, 10" ext. Beck-Steinheil Unofocal Ser. 1., No. 5. f/6 with Beck Celverex shutter, T.B. to 1/80 sec., 3 mahogany double dark slides, stand, focusing cloth, waterproof case, the whole £3 10s. Also ¼-plate Holborn reflex, magazine 12, Ilex, R.R. f/77. T. and I to 1/100 sec. Leather case, £2. Please address, Box 3508, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

SMALL Optician's business for sale, large Lancashire manufacturing town. Small ingoing, stock optional. Box 3511, c/o "The Optician," 125, Fleet Street, E.C.4.

GOOD Practical established optical business required, London or suburbs. State full particulars. Box 3513, c/o "The Optician," 125, Fleet Street, E.C.4.

A YOUNG MAN with 13 years' experience in the optical trade, would like to meet with a young man, not without capital, who is related to an oculist, with a view to starting a business and partnership. Apply, Box 3514, c/o "The Optician," 125, Fleet Street, E.C.4.

WHOLESALE Opticians and watch material dealers business for sale in Clerkenwell. Good position. Best offers over £400. Box 3515, c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 8*

QUALIFIED optician wanted for sight-testing. State age, experience and salary required. Box 5810, c/o "The Optician," 125, Fleet Street, E.C.4.

A LONDON FIRM of retail opticians require a capable manager, or would arrange partnership with applicant having a thorough knowledge of West End prescription work and able to influence additional business. Apply, stating full particulars, which will be treated in strict confidence, to Judson, Box 5811, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT requires progressive berth. Passed S.M.C. examinations except one subject. Good refractionist and salesman. Can do all repairs. In or near London preferred. Box 5779, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. London man of good address, over 15 years' experience, expert in sight-testing and fitting, smart salesman, at present managing branch, seeks change, similar capacity. South Coast or London preferred. Box 5784, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, age 19, requires position, good testimonials. Able to do all Rx work, repairs, and attend customers. Would be indispensable to retail optician doing own jobbing. J. Gasson, 52, Battersea Park Road, S.W.11.

ALL-ROUND Jobber, rimless fitter and V-edge, etc., seeks situation in Glasgow. Box 5783, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACER (all-round) seeks situation (male). Box 5764, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED Young lady required for prescription department. Box 5736, c/o "The Optician," 125, Fleet Street, E.C.4.

UNCUT LENSES.

Bi-Spheres and Peris in all Powers. Lowest Market Prices.

Price List on Application.

BRITISH LENS GRINDING Co., Ltd., 18, Cowleaze Rd., KINGSTON-ON-THAMES.

LORGNETTES.

400 pieces or part lots in Silver and R/G.

At Bargain Prices.

Apply Box 3516, c/o "The Optician," 125, Fleet Street, London, E.C.4

AUTO POLISHERS (by Bryant Symons), New and Renovated second-hand Machines, also Four Spindle **GRINDING MACHINES.**

May be Viewed Running. *All enquiries to the*

ALLIANCE TOOL WORKS, 4, WHITE HORSE YARD,

Rear of 67, Essex Road, Islington, London, N.1

The Optical Society.

President: Mr. R. S. WHIPPLE, M.I.E.E.

Vice-Presidents: Prof. FREDERIC J. CHESHIRE, C.B.E., Director of the Technical Optics Department of the Imperial College of Science and Technology, South Kensington; Sir HERBERT JACKSON, K.B.E., F.R.S.

Hon. Treasurer: Mr. I. G. AITCHISON, B.A., LL.D.

Hon. Secs.: Mr. L. C. MARTIN, B. Sc., Imperial College of Science and Technology, South Kensington S.W.7 and

Papers' Secretary: Mr. F. F. BRYSON, M.A., B.Sc.

MANY SUCCESSES IN THE EXAMINATIONS!

Your Opportunity to

QUALIFY IN OPTICS

PRACTICAL WORK. Students taking the Course may receive personal tuition in the practical work AT ANY TIME DURING THE COURSE.

Expert Tuition by Correspondence for the SIGHT-TESTING DIPLOMAS of the Worshipful Company of Spectacle Makers (F.S.M.C.), or the British Optical Association (D.B.O.A.).

Write for full particulars—

C. A. SCURR, M.P.S., F.S.M.C., F.I.O., etc.

64, High Street - - - - BARNET.

BRITISH OPTICAL INSTITUTE, LTD.,

(College of Optics).

Complete Training for the Sight-Testing Optician.

Supplementary to the usual Daily Classes and Correspondence Courses, a series of Evening Classes is held, for those desirous of preparing themselves for any of the Optical Examinations.

A Course of Weekly Evening Lectures, and Demonstrations, for candidates for the F.B.O.A. Examination, and for post-graduates, has also been arranged.

Clinical Classes.

are held on two afternoons a week, and give Students the special advantage of meeting actual cases, generally of particular interest.

The whole work of the Institute is carried out under the supervision of the Principal, assisted by Mr. Geo. Colebrook, F.B.O.A., F.S.M.C., (Master's Prizeman).

For full particulars apply to:—The Principal, Dr. MAX COGUN, B.Sc., Fern Lodge, 20a, Grove Road, Brixton, S.W.9

Telephone: Brixton 677.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Actual Manufacturers.

WILLIAM GOWLLAND, LTD.,

Price Lists on Application.

Telegraph: "Fundus, Croydon."

Optical Works, Morland Road, CROYDON, LONDON.

AND AT PARIS.

Telephone: 463 Croydon.



Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

***A*.—Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

MANAGER experienced, excellent salesman, subjective and objective methods, requires situation, excellent refs. O. E. Smith, c/o Benn Franks, 98, Linthorpe Road, Middlesbrough.

WANTED. Junior assistant. Write, stating age, experience and salary required to Aitchison & Co., Ltd., 38, Bucklersbury, E.C.4.

YOUNG LADY, age 17, seeks re-engagement in optical wholesale firm, experience in looking-out and despatching orders, 2 years' reference. Box 5806, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST seeks position where he could gain experience in edging, drilling, etc. Careful and conscientious worker. Box 5807, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED refractionist and salesman (27) requires position as manager or first assistant. Knowledge of photography. Last position 10 years. Apply, Box 5808, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN requires situation in retail opticians. Four years' experience factory and sight-testing. London or district preferred. Box 5809, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. with good all-round experience requires position as manager or first assistant. Please state salary offered in first letter. Box 5812, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACE Worker desires situation. 16 years in London. Experience in wholesale and retail. Well up in all glass work. Good knowledge of glazing and drilling. Able to take charge. Box 5813, c/o "The Optician," 125, Fleet Street, E.C.4.

JEWELLER-OPTICIAN'S Son, 21, passed major part S.M.C., desires post with optician, London, where good practical experience can be obtained. Vennall, High Street, Chesham, Bucks.

WANTED for London, fully qualified optician quick and accurate O. & S. methods. Capable of taking control and opening new branches, and with ideas on advertising. Good opening to right man. Particulars in confidence to Box 5803, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED for Belgium, an all-round prescription hand. Must be able to do edging and rimless fitting, etc. Salary 600 francs per month and lodging free. Apply, by letter only to Lever Bros., 18, Hatton Garden, E.C.1.

OPTICIAN, age 34, desires change, 20 years in sight-testing business, 10 years as branch manager. Apply, Box 5802, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, 18, requires situation, good knowledge of optical repairs and photography. Home or abroad. Box 5804, c/o "The Optician," 125, Fleet Street, E.C.4.

SITUATION required by young lady with retail or wholesale optician, 5 years' experience with qualified optician, can do small repairs, neutralising and frame fitting. Good saleswoman. Apply, Box 5805, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Man, 18, seeks situation as stockroom assistant. No experience. Box 5800, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED. Charnley & Sons, require first-class rimless edger, fitter and repairer in their workshop. Apply, 597, Lord Street, Southport, Lancs.

YOUTH, 19, requires situation where further knowledge of optics could be obtained, has had three years' experience in Jeweller Opticians. Witham, 20, High Street, Abingdon.

YOUNG LADY requires situation, clerk or receptionist, Liverpool district, 5 years' experience with leading firm. Clarke, 44, Northbrook Street, Liverpool.

GENTLEMANLY Youth just left school wishes an apprenticeship to learn sight-testing in a first-class establishment, to live in. Provincial town. 207, High Street, Stoke Newington, N.16.

SMART Salesman and expert fitter with knowledge of sight-testing required for London. State age, experience and salary to Box 5797, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG Lady, D.B.O.A., F.S.M.C., with general optical experience, desires a position in London, moderate remuneration. Box 5790, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN requires situation in any capacity. Apply Box 5801, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION as branch manager or first assistant required in London or suburbs. Passed S.M.C. examination excepting one subject, careful refractionist O. & S. methods. Can do all repairs, also edging and fitting. Good all-round knowledge, own test case, etc. Box 5767, c/o "The Optician," 125, Fleet Street, E.C.4.

RIMLESS Edger and fitter accustomed to best class work required immediately. Apply, giving age, particulars of experience and salary required to Mr. Reid, 3, Queen Street, Exeter.

WANTED for Yorkshire city, refractionist, having passed F.B.O.A. or F.S.M.C. Give age, references and salary required. Knowledge of jewellery an advantage. Box 5798, c/o "The Optician," 125, Fleet Street, E.C.4.

LOCUM TENENS, retired, elderly, experienced, qualified sight-tester and practical rimless fitter, requires occasional employment, days, weeks or months, any time or distance. Apply, Box 5786, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., 21, requires position as first assistant. Fully experienced, and can take full charge. Box 5788, c/o "The Optician," 125, Fleet Street, E.C.4.

MECHANIC used to meteorological and general instrument work, hand-turning bench, finishing and lacquering. 18 years' experience, any distance, town or country. F. Orford, 83, Ashmore Road, Paddington, W.9.

LADY desires post as clerk, 5 years' general office experience,, quick at figures, typing. Good references. Box 5778, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS rimless fitter and glazier, both bevel, shell and rimless, bifocal work, 11 years' experience, seek post. Box 5777, c/o "The Optician," 125, Fleet Street, E.C.4.

SITUATION required by good all-round man, well up in refraction and all repairs and rimless work. Also Kryptoks and cement bifocals. Able to take entire charge. Apply, Box 5781, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST, used to working class trade, good retinoscopist and salesman, 20 years' experience, open to engagement. Optician, 49, Hazlewood Avenue, Newcastle-on-Tyne.

REFRACTIONIST, young lady, age 25, thoroughly experienced in all branches of sight-testing, desires position as assistant to sight-testing optician. Used to sole charge. Midlands preferred. Box 5773, c/o "The Optician," 125, Fleet Street, E.C.4.

LOCUM TENENS disengaged, capable and experienced refractionist, thoroughly reliable and practical workman, used to management. Excellent credentials. Box 5774, c/o "The "Optician," 125, Fleet Street, E.C.4.

Concluded on page 6.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Are You Satisfied

that the abrasive you are now using gives you

The Best Possible Results?

If not, ask your wholesaler for trial samples of

"U.K." No. 4 and No. 5 Emeries and Rouge

You will be pleased with them and will require regular supplies. They are put up in tins of convenient size containing 5 lbs.

UNITED KINGDOM OPTICAL CO., LTD.,

(Wholesale and Export Only.)

MILL HILL, LONDON, N.W.7

Digitized by Google

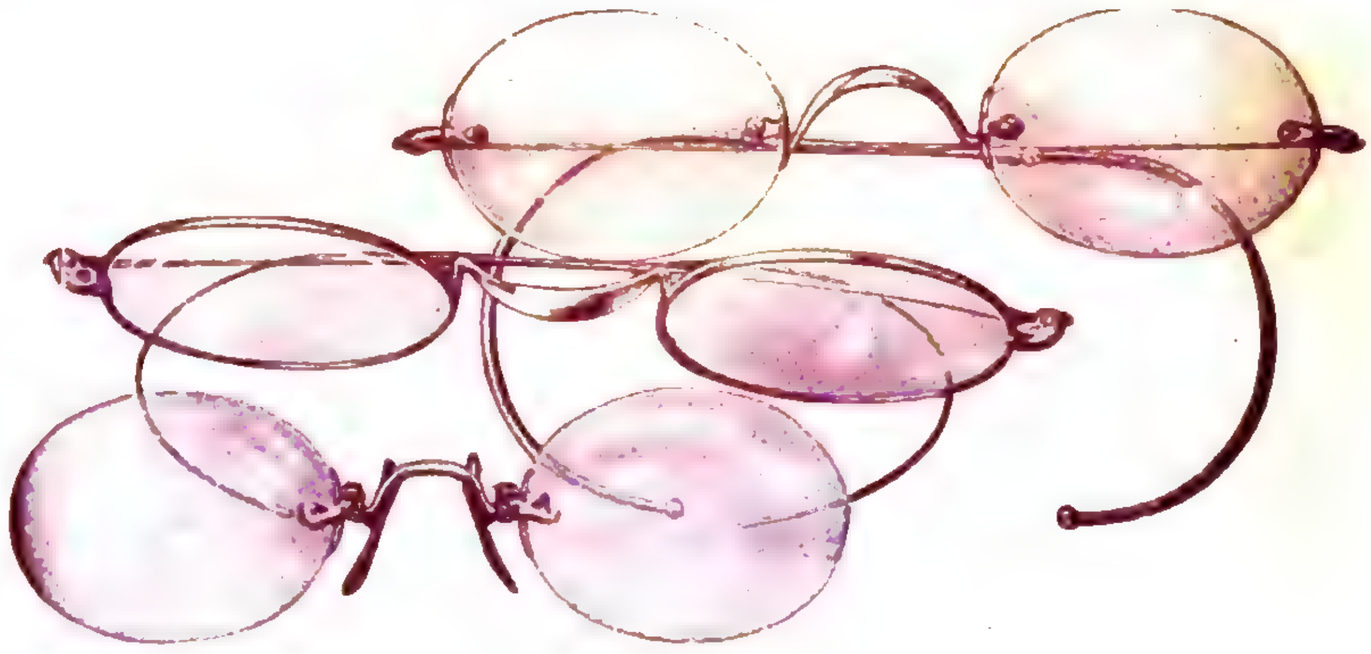
Original from THE OHIO STATE UNIVERSITY

THE OPTICIAN
Reg. at G.P.O. as a Newspaper

AMERICAN·OPTICAL·COMPANY, LIMITED

THE BIG THREE

Durability–Economy–Attractiveness



All of these features are embodied in Wellsworth Alummico Spectacles and Eyeglasses. The special metal used for their construction is made according to A.O.Co. specifications, adopted after years of experimenting.

Wellsworth Alummico eyewear is popular wherever used. Its lightness, without sacrificing durability, its economy without sacrificing quality, and its attractiveness all tend to encourage sales.

If you are not using Wellsworth Alummico, ask your wholesaler to show it to you. And you who use it, know the merits.

WELLSWORTH

TRADE (A) MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C., (Printed by The Century Press, Fulham), Jan. 6, 1922.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT-MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1607 FRIDAY, JAN. 13, 1922.

WELLSWORTH LENS DRILLING MACHINE

A most efficient and inexpensive Drilling Machine.

The Lens Holder is very simple in construction, it is mounted on a round stem so that it can be turned to any angle to suit the operator.

The practical Machine for a small Shop.



M. 92

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

AMERICAN OPTICAL COMPANY, LIMITED,

39, Hatton Garden, LONDON, E.C.1

Reg'd at the G.P.O. as a newspaper PRICE 4d Subscription post free 12 months 17s.

Postage in United Kingdom

Digitized by Google Original from THE OHIO STATE UNIVERSITY

THE

PATENT L. W. ORTHOPS 167902.



THE L-W ORTHOPS OPHTHALMOSCOPE

This new instrument is entirely reflecting and eliminates most of the difficulties of ordinary ophthalmoscopy; with the minimum of practice, an excellent view of the fundus is obtained.

The instrument is worked by an ordinary small dry cell battery, measuring $3\frac{1}{4}'' \times 3''$.

It is an instrument that should be possessed by every sight testing optician who wishes to make ophthalmoscope examinations.

It can be obtained from any Wholesale Optical House, from whom a fully descriptive pamphlet can be had on application.

Manufactured by **GEORGE CULVER, Ltd., London, N.1**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

W.H.T.

QUALIFIED BY EXPERIENCE

You do not "take RISKS" when you place your Rx work with us, we have an efficient and experienced staff, up-to-date equipment and every possible facility for executing :-

RX SERVICE.

OPTICAL SUPPLIES OF EVERY DESCRIPTION.

Samples and Prices on application.

WALTER H. THOMPSON

66 HATTON GARDEN, LONDON, E.C. 1.

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

J&R F LTD

Price Alterations.

Our latest Price Lists of the following are ready and may be had on application:—

Wellsworth Windsor Spectacles,

also

CASES,

CHAINS,

LORGNETTES, etc.

All the above are revised in accordance with our usual policy of supplying the best goods at moderate prices.

J. & R. FLEMING LTD.,

136-148 Clerkenwell Road,

LONDON, E.C. 1.

Telephone:
HOLBORN {814 / 815}
HOLBORN {2788 / 2789} Prescription Dept.

Telegrams:
"OTTICO." LONDON.

Branches with Prescription equipment:

WALTER BRAHAM & Co. Ltd.
6, Key Hill Drive,
BIRMINGHAM.
Phone: Central 2569
Telegrams: "Brahma."

37, WESTGATE STREET,
CARDIFF.
Phone: Cardiff 44
Telegrams: "Ottico."

5, GROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1665.
Telegrams: "Ottico."

8, SHUDEHILL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

J&R F LTD

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
The Rt. Hon. VISCOUNT HILL, L.C.C.

Upper Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Renter Warden
HARRY HYLTON-FOSTER. Esq., Past Master.

Director of Examinations
The Rt. Hon. SIR WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in May, 1922.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receiv them*

The OPTICIAN And SCIENTIFIC INSTRUMENT·MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,607

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, JAN. 13, 1922.

The Almanac.—When this reaches the hands of our readers the distribution of the 1922 Optical Almanac will be in progress, and copies should be received by all subscribers within a few days. The current diary is of course dated forward to the 14th inst.

* * *

The Microscope.—A very valuable "Simple Handbook of the Microscope" has been issued at half-a-crown by Messrs. R. & J. Beck, of Cornhill, London. The author, Mr. Conrad Beck, is well-known as a master of his subject in all its branches; and this well illustrated book gives very full details of the information needed by an optician when selling a microscope, and by the purchaser when using it.

* * *

With regard to other instruments than the microscope—as the sextant, for example—there is also a demand for simple text books giving instruction in the methods of adjustment and use, adapted to the needs of both dealers and their customers. Unfortunately this kind of literature is not available here to the same extent as it is on the continent. There is a big literature of photography; but

Digitized by Google Original from THE OHIO STATE UNIVERSITY

elementary handbooks of the various measuring instruments, slide rules, polarimeters, hydrometers, and so on, are looked for in vain. Information on the construction (including elements of design) and testing or adjustment of the telescope, has to be sought among periodicals of small circulation, issued by the learned societies, which it is difficult or at best inconvenient to refer to. Scientific instrument makers could usefully contribute to remedy this state of things. If apparatus that is of distinctively British design were more adequately dealt with in popular handbooks—as distinct from the trade catalogue as from the general text books of physics—the advertising value of the work would be considerable, here and in Britain overseas and even in the United States of America. Information as to new designs and all that concerns the dealer or manufacturer can be freely published through our own columns; and more might be done in that way with advantage to all interested. What is above referred to, however, is the information of a public including the ultimate purchasers and users of the instruments.

INFINITY AT 6^m or 9^m ?

By E. MAYER (Paris)

Why is it that 6^m distance is reckoned, in refraction practice, as infinity? Some books say that rays diverging from a point 6^m away and entering the pupil are practically parallel. This is not quite true. Taking the pupil as 4^{mm} wide, its apparent angle at 6^m is

$$\left(\frac{10800}{3,14} \times \frac{4}{6000}\right)'$$

or $2' - 17''$. Inversely, the visual angle of $2' - 17''$ at the nodal point is greater than the average one taken as unit for visual acuity, which proves that parallelism is not approximative enough. And even if it were, no reason would justify that an ocular image from our object at infinity and another one from 6^m are at the same plane in the retina or sufficiently near one another.

The hyperfocal length of any optical instrument is connected with the deepness of focus. According to Newton's formula, the displacement of an image corresponding to a displacement of object from infinity to 6^m is

$$\frac{nf^2}{6000}$$

Taking $n = 1,33$ and $f = 15^{mm}$ for an average eye, this makes a displacement of $0^{mm},049$ or 49μ. It is too much to keep a good definition of the retinal image. The bacillary layer is about 60μ thick but the cones are only 30μ. Let us assume that only half of this thickness may be considered as being available to keep a good image. The hyperfocal length is then

$$\frac{nf^2}{0,015} = 19950^{mm}$$

or about 20^m. At this distance, the apparent angle of pupil is

$$\left(\frac{10800}{3,14} \times \frac{4}{20000}\right)'$$

or $0' - 41''$ and inversely this angle is the limit of approximative parallelism for 1,46 of standard visual acuity, which is often the case with young men. Rays entering the pupil may be then considered parallel.

Practically, however, we take $0,^d25$ as the least useful interval worth considering in dioptric value. Then

$$\frac{1}{6} - \frac{1}{20}$$

or $0^d,11$ is considered negligible for refraction. So we can keep 6^m as equivalent to 20^m and consequently to infinity. But in America, they make use of $0^d,125$ intervals. Only $0^d,062$ is considered negligible. The limit distance x^m for which

$$\frac{1}{x} - \frac{1}{20}$$

is negligible is given by equation

$$\frac{1}{x} - \frac{1}{20} = 0,062$$

which gives $x = 8^m,92$

The charts for subjective examinations must be placed 9^m away in order that intervals of $0^d,12$ be available.

At this distance, the limit of approximative parallelism is

$$\left(\frac{10800}{3,14} \times \frac{4}{9000}\right)'$$

or $1' - 31''$ and corresponds to 0,66 of standard acuity.

New Agency.

The old-established firm of Jules Lang & Son, of Charlton Works, Charlton Place, Islington, N.1., have, we learn, been appointed sole agents for the United Kingdom and Colonies, for the well-known French optical manufacturers, "La Manufacture Generale D'Optique," Ligny, France, and the trade are invited to get in touch with Messrs. Lang & Son, who holds stocks of their lenses in London.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

On the Best Form of Spectacle Lenses—XXI.*

By A. WHITWELL, M.A., Fellow of the Optical Society.

Binocular Vision and the Field of View.

In my last article, I investigated the apparent change in the field of view caused by the use of spectacle lenses of various forms, by calculating the principal curvatures of the object field which would appear to be plane. The method used was one which would be used by a practical designer. In the present article I propose to treat the same problem more generally by the method which would be adopted by a pure mathematician.

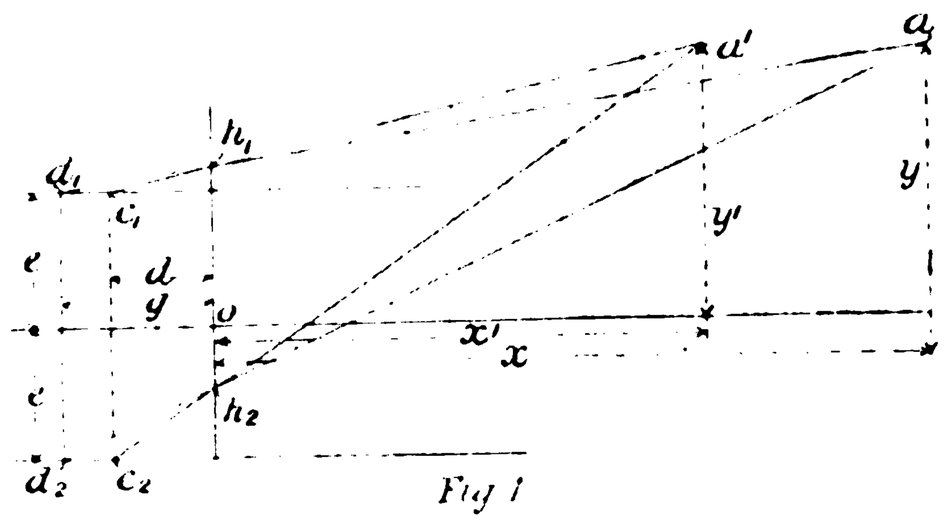


Fig 1

Referring to fig. 1, let a be a point on the object, a, h_1, d_1, a, h_2, d_2, two rays from the point a incident at h_1 and h_2 on the left and right components of any optical system, and a', h_1, c_1, a', h_2, c_2, the corresponding rays after refraction by the optical systems. The point a will appear to be at a' which will therefore be the image of a.

The points c_1, c_2 are the centres of rotation of the left and right eyes the points d_1, d_2 are conjugate with c_1, c_2 with respect to the optical systems and the horizontal lines through c_1, d_1 and c_2, d_2 are the optic axes of the two components of the optical system. The x axis of co-ordinates is the horizontal line midway between and parallel to the optic axes. The y axis is at right angle to the x axis in the plane of the diagram and the z axis is of course normal to the plane of the diagram, the origin being at o.

I am going to make two assumptions with respect to the two components of the optical system.

1. The locus of the intersections of corresponding incident and emergent rays such as ad_1 and $a'c_1$ will be supposed to be a plane, at right angles to the optic axis, which we will call the intersection plane.

2. Each system will be supposed to be corrected for spherical aberration for the centre of rotation of the corresponding eye.

The pairs of points c_1 and d_1 and c_2 and d_2 being conjugate it follows that any ray directed to the point d_1 or d_2 will after refraction pass through the centre of rotation c_1 or c_2. The line h_1, h_2 will be the trace on the diagram of the intersection plane. The distance of the centre of rotation c_1 from the intersection plane is called d, that of the conjugate point d_1 from the same plane is called g, and the inter-ocular distance $2e$.

Let x, y, z, be the co-ordinates of an object point a.

,, x', y', z', be the co-ordinates of an image point a'.

,, x_1, y_1, z_1 be the co-ordinates of an intersection point h_1.

,, x_2, y_2, z_2, be the co-ordinates of an object point h_2.

Then from similar triangles we have

$$\frac{y-e}{x+g}=\frac{y_1-e}{g} \quad \dots 1 \qquad \frac{y'-e}{x'+d}=\frac{y_1-e}{d} \quad \dots 2$$

$$\frac{y+e}{x+g}=\frac{e-y_2}{g} \quad \dots 3 \qquad \frac{y'+e}{x'+d}=\frac{e-y_2}{d} \quad \dots 4$$

$$\frac{z}{z_1}=\frac{y-e}{y_1-e} \quad \dots 5 \qquad \frac{z'}{z_1}=\frac{y'-e}{y_1-e} \quad \dots \dots 6$$

From (1) and (2) we get

$$\frac{g(y-e)}{x+g}=\frac{d(y'-e)}{x'+d}$$

or

$$x'=\frac{d(y'-e)(x+g)-dg(y-e)}{g(y-e)} \quad \dots \dots 7$$

and from (3) and (4) we get similarly

$$x'=\frac{d(y'+e)(x+g)-dg(y+e)}{g(y+e)} \quad \dots \dots 8$$

*The other articles in this series were published in THE OPTICIAN on the following dates, May 2, July 25, 1913; Jan. 9, Jan. 23, Feb. 6, Feb. 20, April 3, April 10, May 29, July 3, Aug. 21, Sept. 4, Oct. 30, 1914; Dec. 15, 1916; Aug. 29, Oct. 3, Oct. 31, 1919; Jan. 9, Nov. 19, 1920; June 17, Nov. 25, 1921.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Equating the values of x' in (7) and (8) we find that $y'=y$ and putting this value of y in (7) or (8) we get

$$x' = \frac{d}{g}x$$

From (5) and (6) we see that

$$\frac{y_1-e}{y-e}z = z_1 = \frac{y_1-e}{y'-e}z'$$

$$\therefore \quad \frac{z'}{z} = \frac{y'-e}{y-e} \text{ and as } y=y'$$

we must have $z=z'$.

Collecting these relations

$$\left.\begin{aligned} x' &= \frac{d}{g}x. \\ y' &= y \\ z' &= z \end{aligned}\right| \qquad \left.\begin{aligned} x &= \frac{g}{d}x' \\ y &= y' \\ z &= z' \end{aligned}\right.$$

We see that if the object is a plane the image will also be a plane. For example if the object is a plane (z, y) at right angles to the axis of x the image plane will also be at right angles to the axis of x, but will be nearer to the instrument, the ratio of the distances of object and image being g/d; an object plane parallel to the axis of x say (x, y) or (x, z) but will remain unchanged each point in it will be shifted parallel to the axis of x and nearer to the origin in the ratio g/d.

An object surface of the second degree will become an image surface of the same degree. Thus if the object is a sphere centered at the origin and of radius r its equation will be $x^2+y^2+z^2=r^2$, the equation of the corresponding image surface will be

$$\frac{g^2}{d^2}x'^2+y'^2+z'^2=r^2$$

which shows that the surface is an ellipsoid of revolution or an oblate spheroid. The spherical object will appear to become squashed along the axis of x. Suppose the object to be a horizontal circle centered at the origin and in the plane (x, y) its equation will be $x^2+y^2=r^2$, and that of its image

$$\frac{g^2}{d^2}x'^2+y'^2=r^2$$

Thus if we are at sea and we look at the horizon through a binocular instrument satisfying the conditions or assumptions (1) and (2) given above, keeping the instrument at rest and rolling the eyes, the horizon will appear to be an ellipse, the shorter axis being along the axis of x, and the longer axis along the axis of y.

The above conditions (1) and (2) which must be satisfied if a binocular instrument is to give a plane image of a plane object are the same as those which must be satisfied by a projecting instrument such as a photographic lens if the image is to be free from distortion. They may be expressed otherwise as (1) Tangent condition, (2) Spherical correction for the center of the stop.

Both of these conditions cannot be fulfilled by a single lens and consequently in general a single lens cannot give a plane image of a plane object as was shown in the last article.

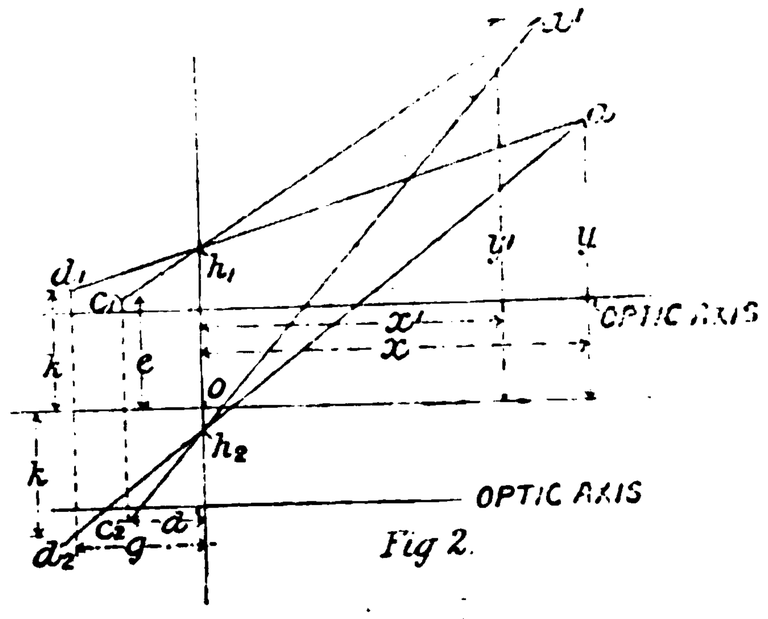


Fig 2.

Decentering the Optical Systems.

Referring to fig. 2, the distance between the optic axes of the two components is supposed to be less than the interocular distance. The centres of rotation of the left and right eyes are marked c_1, c_2 and the points conjugate to these are marked d_1, d_2 as before. The distance apart of the points d_1, d_2 is now greater than $2e$, and I have called it $2k$.

By similar triangles we have

$$\frac{y-k}{x+g} = \frac{y_1-k}{g} \quad \dots 9 \qquad \frac{y'-e}{x'+d} = \frac{y_1-e}{d} \quad \dots 10$$

$$\frac{y+k}{x+g} = \frac{k-y_2}{g} \quad \dots 11 \qquad \frac{y'+e}{x'+d} = \frac{e-y_2}{d} \quad \dots 12$$

$$\frac{z}{z_1} = \frac{x+g}{g} \quad \dots 13 \qquad \frac{z'}{z_1} = \frac{x'+d}{d} \quad \dots 14$$

By eliminating x_1, y_1, z_1, from these equations we obtain the following relations between x, y, z, and x', y', z'.

$$x' = \frac{dkx}{eg-x(k-e)} \qquad x = \frac{egx'}{dk+(k-e)x'}$$

$$y' = \frac{egy}{eg-x(k-e)} \qquad y = \frac{dky'}{dk+(k-e)x'}$$

$$z' = \frac{egz}{eg-x(k-e)} \qquad z = \frac{dkz'}{dk+(k-e)x'}$$

From these results we see that if the object

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



Have They Been Working for You?

At the end of September, 1921, we made public an offer to supply Opticians free with the blocks for the advertisements which are here illustrated in quarter-size facsimile.

Since that time we have had a steady flow of demand for the series or part of the series. We understand that already the Opticians who took such prompt action have noticed a distinct benefit—in general business as well as in

Chance's 'CROOKES' Glass

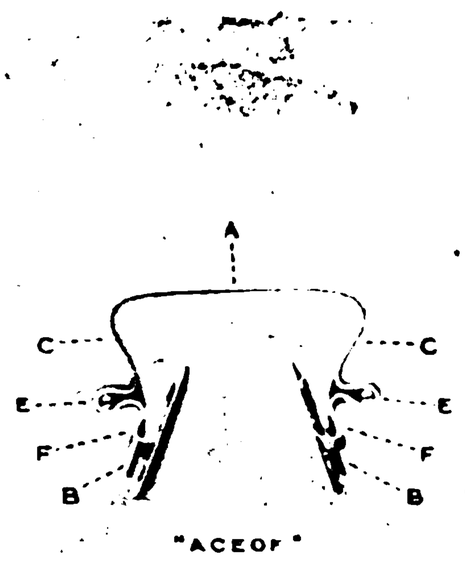
If you are thinking over your advertising policy for 1922, consider seriously this series of advertisements. Our offer to supply the blocks free is still open.

CHANCE BROS. & Co., Ltd.,
Glass Works,
SMETHWICK, BIRMINGHAM.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Phone:—City 3225 (3 lines) *Telegrams:—Bulford, BARB. London.*

PATENT



"ACEOF"

MOUNTINGS

"ACEOF" REG.

NOTE the bridge A, with its graceful curves terminating at B.B. engaging the periphery of the lenses from C to B with a soft firm springy grip when fastened into position by the screw lugs E.E. Placquets adjustable at F.F. Simplicity is the Ace of its charm.

Made in Gold only—the first order for one dozen being supplied as follows:—Eight empty, and the remaining four made up as a fitting set in a nice case and a pair of plyers for adjusting.

"29 by 41."

The **"Aceof"** Mount lends itself to another important development—namely, what we term the Scientific Optical Size of Lenses—the 29 by 41 size.

The 29 by 41 is an ideal base measurement for a Lens size. Add or deduct as conditions require but maintain the basic shape of 29 by 41. An ideal shape governed by the muscular movement of the human eye.

Made by the firm whose Reputation for Prescription Work is:—*"Second to None."*

NEWBOLD & BULFORD, ***Prescription House,***
GOSWELL ROAD, LONDON
E.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

is a plane the image will be a plane. If the object is the plane

$$lx+my+nz=p.$$

the image will be the plane

$$legx'+mdky'+ndkz'=p\ (dk+(k-e)\ x').$$

or

$$\{leg'-p(k-e)\}\ x'+mdky'+ndkz'=pdk$$

if the object is a plane at right angles to the axis of x say at a distance q from the origin the equation of this object plane will be $x=q$, and the equation of the image will be

$$q=\frac{egx'}{dk+(k-e)x'}$$

or

$$x'=\frac{qdk}{eg-q\ (k-e)}$$

which is also a plane at right angles to the axis of x, but at a distance from the origin equal to

$$\frac{qdk}{eg-q\ (k-e)}$$

If the object is a plane at right angles to the axis of y at a distance q from the origin its equation will be $y=q$, and the equation of the image will be

$$q=\frac{dky'}{dk+(k-e)x'}$$

$$q\ (k-e)\ x'-dky'+qdk=o$$

which is a plane parallel to the axis of z and cutting the plane (x, y) in the line given by the last equation, *viz.*,

$$y'=\frac{q(k-e)}{dk}\ x'+q \qquad \ldots \qquad 15$$

Similarly if the object is a plane at right angles to the axis of z at a distance q from the origin the equation of the image plane is

$$q=\frac{dkz'}{dk+(k-e)x'}$$

which is a plane parallel to the axis of y and cutting the plane (x, z) in the line

$$z'=\frac{q(k-e)}{dk}\ x'+q \qquad \ldots \qquad 16$$

An interesting point arises out of the last result. Suppose for example, we could design a spectacle glass composed of more than one lens, such that it satisfies conditions (1) and (2) above and suppose the wearer of the spectacles to stand erect so that the axes of x and y are horizontal and the axis of z vertical. The ground would represent a plane at right angles to the axis of z at a distance from the origin equal to the height of the eyes above the ground. The image of the ground would be a plane parallel to the axis of y but inclined to the horizontal. The co-efficient of x' in equation (16), *viz.*,

$$\frac{q\ (k-e)}{dk}$$

is the tangent of the angle which the image plane would make with the horizontal plane. Now if k is greater than e, that is if the lenses are decentered inwards, the tangent of the angle of slope of the image will be positive and the ground will appear to slope *downwards* in the direction away from the observer. But if k is less than e or if the lenses are decentered outwards the tangent is negative and the ground will appear to slope *upwards* in the direction away from the observer who will appear to be looking up hill. Although a single lens cannot be made to fulfil the conditions (1) and (2) I am informed by Dr. J. H. Tomlinson that he has known cases in which a patient has complained that his glasses give him the impression that he is walking uphill and make him appear shorter than he really is.

In an analogous manner if one stood in the middle of an avenue of poplar trees, lenses decentered inwards would make the distant trees appear to spread outwards or would tend to counteract the usual perspective whilst lenses decentered outwards would make the distant trees appear to approach more rapidly, that is the vanishing point would become nearer. I have not heard whether this particular result has been observed.

In conclusion I should like to emphasize the fact that the conclusions arrived at in this article do not apply strictly to spectacle lenses, as the conditions (1) and (2) cannot be fulfilled, but they do apply to compound binocular systems which satisfy the tangent condition and are spherically corrected for the centre of rotation of the eye.

You cannot afford to do without THE OPTICIAN.

As a manufacturer you need be acquainted with all published information bearing on design and on workshop technique. As a merchant you require to be kept informed of the latest novelties in spectacle-work and scientific instruments, so that you may be able to deal intelligently with all enquiries on these matters. As a sight-testing optician you want to know what is newest in connection with the refraction of the eye and the prescribing and fitting of spectacles. If you are interested in any way in the optical industry, you must keep abreast of its development by reading the technical and other trade news which is to be found only in THE OPTICIAN.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Light and Chemical Energy.*

By Professor PIERRE WEISS, University of Strasbourg.

Let us now put the same amount of vapour at the same temperature in a container holding 1,000 litres. The molecules moving at the same velocity will have a thousand times as much space at their disposal and shocks of contact between them will be only 1/1000 as frequent. And yet we know by experience that the dissociation takes place with the same velocity. Therefore, it would seem impossible that the dissociation is produced by the shocks of contact between molecules due to thermic agitation.

But these difficulties and discrepancies vanish if we assume that the reactions are occasioned, not by the thermic agitation itself, but by the accompanying radiation. Thus no matter what the size of the container at the same temperature, the molecules of hydriodic acid would be immersed in the same medium, consisting of infra-red radiations—and, if the temperature is high enough, of visible and ultra-violet radiations also—rushing through space in every direction. If we could accept this theory therefore, there is nothing to surprise us in the fact that the velocity of dissociation is independent of the space occupied by the substance.

We must believe with Perrin that every chemical reaction is produced by a radiation having a specific wave-length. If this be true it would suffice, in order to estimate the variation in velocity of the reaction due to temperature, to know the variation in the amount of this *active light* within the complex mixture of radiation. But it is a very remarkable fact that this calculation leads us to precisely that law which Arrhenius deduced from experiment some 30 years ago, and which has hitherto remained inexplicable.

Inversely, if we determine by experiment the velocity of the variation in a reaction due to temperature, we can determine the wave-length of the ray of light which causes the reaction. For this purpose it is only necessary to choose among the complex mixture of rays of light of different wave-lengths that which has the same velocity of variation. Much study along this line will doubtless presently be undertaken—we will merely say now that in those cases in which such a calculation has thus far been made the wave-lengths obtained have been entirely plausible.

[Concluded from page 307.]

Let us now examine the same question from a different point of view. We know that coloured substances merely select certain rays from white light and reflect them, while they absorb and destroy all the others. But there is one very important exception to this rule. Let us take a substance termed fluorescent, *e.g.*, a piece of glass containing certain amounts of salts of uranium incorporated with it. Expose this to a beam of light containing only the violet light which we obtain by passing a beam of white light through a coloured filter. In this violet beam, the uranium glass will shine brilliantly, diffusing in every direction a vivid greenish yellow light. Thus we see that uranium glass is capable of transforming the original violet light into yellow light, *i.e.*, a light different both in colour and in wave-length.

Organic chemistry provides numerous examples of fluorescent substances among which some of the best known are fluorescein, eosein, esculin, quinine sulphate, etc. The phenomenon is often intense enough to be perceptible even when the fluorescent substance is present only in an exceedingly dilute form or in extremely thin sheets. M. Perrin placed under a microscope an extremely thin layer of a solution of these substances and exposed it to an exceptionally strong light by projecting upon it the image of the electric light. He was thus enabled to make an important and fruitful observation, namely: that the fluorescence of that part of the substance touched by the image of the arc light is extinguished at the end of a few minutes. If the preparation is so placed as to expose fresh portions of the substance to the light, these portions will become fluorescent and then be extinguished in their turn.

It is evident, therefore, that fluorescence is not, as had been thought, a permanent quality of certain molecules, but is, on the contrary, the visible sign of their disappearance. The molecule struck by a certain radiation, by violet light, for example, dies as it projects a flash of green light and gives birth to a molecule of a different kind. The reason why the destruction of the substance at the moment it becomes fluorescent had hitherto been unper-

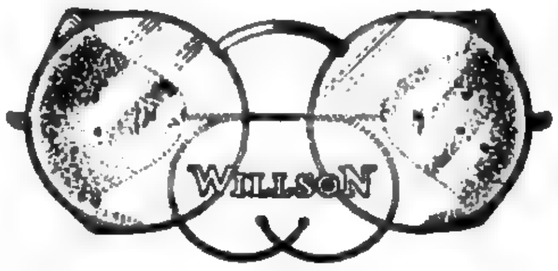
* From an address at the Congress of the Union of the Industrial Societies of France.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

WILLSON GOGGLES

We Invite Correspondence.

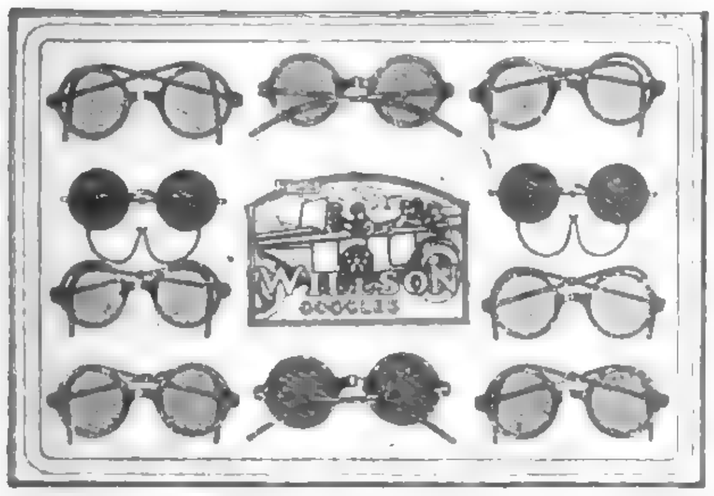
We manufacture goggles for protecting the eyes from sunlight, dust, glare and wind. Also safety goggles for protecting workmen at industrial operations.



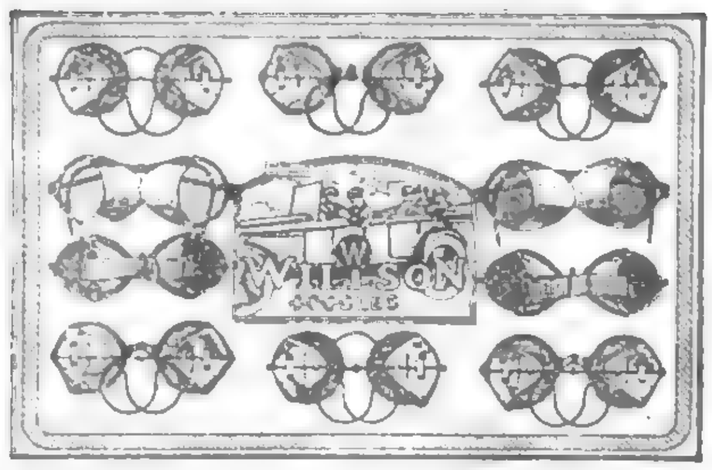
Style A1.—48mm micoquille lenses in amber, fieuzal, smoke and amethyst colors; or clear. Good leather side shields, adjustable bridge and cable temples. Metal case.



Style N88.—48mm micoquille lenses in amber, fieuzal, smoke and amethyst colors; or clear. Perforated metal side shields, saddle bridge and cable temples. Cardboard box.

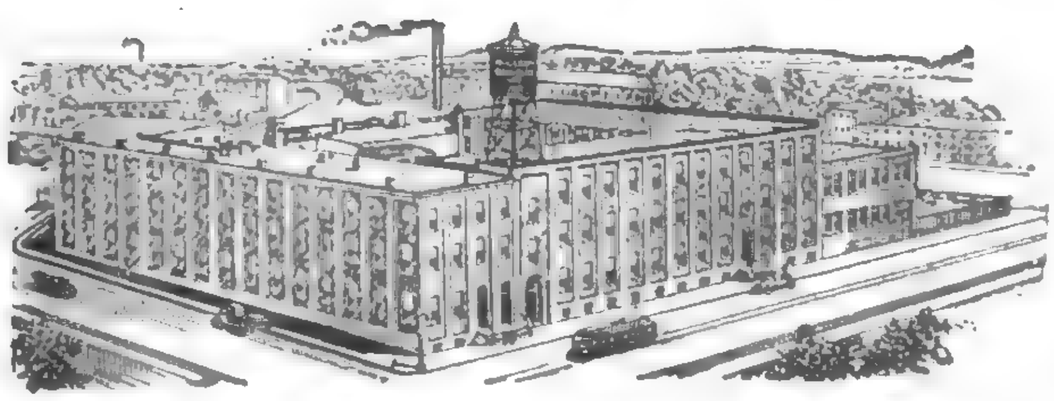


Assortment Y10.—Ten high-grade imitation shell goggles WITHOUT side shields displayed on a heavy, colored artboard with easel. The goggles are sold off this display at a uniform price. Strong shipping container.



Assortment Y15.—Ten high-grade goggles WITH side shields. Assorted styles of imitation shell, white metal and their combinations. Same display board and shipping container.

These assortments have good-quality micoquille lenses in the most popular colors.



WILLSON GOGGLES INC., READING, PA., U.SA.

British Office and Warehouse: S. PULZER, 9, Hatton Garden, London, E.C.1

Australasian Representative, WILLIAM LEWIS, Ltd., Stafford House, 316, Pitt St., Sydney.

Largest plant in the world devoted exclusively to the manufacture of eye-protective devices. Trade Mark Registered in The United States Patent Office, Great Britain, Australia, France, Brazil, Argentine, Chile, Bolivia, Peru, Uruguay, Cuba and Japan.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

L.O.C.

To remind Old "Optician" Readers and inform New Ones, we set out once more the Reasons why the L.O.C. can and does Render Efficient Rx Service to Britain's Sight Testing Opticians.

The L.O.C. possesses the latest type of plant and machinery.

The L.O.C. employees are all highly trained people, interested in their work, and anxious to maintain the high standard of service for which the L.O.C. is renowned.

The L.O.C. system of inspection is particularly thorough. Constant supervision of all the work by one or other of the principals is an integral part of the Service.

The L.O.C. charges are invariably most fair.

The L.O.C. facilities enable unusually prompt deliveries to be made.

TO ALL "OPTICIAN" READERS, WE NOW SAY

Give us the opportunity to prove to you that the L.O.C. Service will completely satisfy your requirements.

Telephone: CENTRAL 4572

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris, France.

Also at—2, Str-Barsei, Bucharest, Roumania.

Telegrams: Locoptical Kinerose London.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

ceived, is that until Perrin made his experiment investigators had always made use of too feeble an illumination and had employed such large quantities of the substance that the diminution of the latter could not be observed.

Fluorescence.

M. Perrin looks upon fluorescence as the typical case of all chemical reaction; a radiation is absorbed and occasions the reaction which gives rise to the emission of another radiation. The peculiarity of fluorescent substances consists in the fact that the radiation emitted and in many cases also the radiation absorbed are found in the visible spectrum. But when we remember that the invisible spectrum is far more extensive than the ultra-violet rays, there is nothing surprising in the idea that the eye fails to perceive any radiation in those reactions which are the most numerous and most ordinary of all.

M. Perrin has gone a step further, deducing by the doctrine of quanta (which there is no need of going into here) from a knowledge of the wave-lengths of the exciting light and the emitted light the amount of heat liberated in a given chemical reaction. The calculation made by him concerns the transformation of ozone into oxygen and the figures obtained were 62,000 calories, whereas 60,000 calories are obtained by direct observation. This is, very evidently, remarkably close agreement.

Let us take another experiment: Let us expose to daylight some calcium sulphide containing traces of metallic impurities, and afterwards examine this substance in a dark room. At first it shines with a comparatively bright light, but the intensity of the light diminishes by degrees. This is the phenomenon known as phosphorescence. The substance has absorbed certain rays of the light to which it has been exposed and later it yields these up. While this phenomenon is somewhat akin to fluorescence, it is distinguished from it by the fact that in reality it comprises two inverse reactions.

When the substance is exposed to sunlight some ray present in the incident light causes a chemical reaction of unknown nature and this reaction is accompanied by the emission of a certain infra-red ray. An exactly inverse reaction is involved necessarily in the re-emission of the absorbed light and the absorption of the emitted light. But in the mixture of infra-red rays in which all substances are immersed at ordinary temperatures, the substance will find the precise radiation which it emitted to begin with. This radiation will incite the inverse reaction and as a result, the incident light will be emitted.

This theory suggests a method of verification. If it be true that it is a certain infra-red ray which causes the emission of the stored up light, then it ought to be possible to increase the effect by increasing the intensity of this infra-red light. This can be done by exposing the phosphorescent substance to the infra-red spectrum of an incandescent body. As a matter of fact this experiment was actually made by Becquerel a good many years ago, but the results remained unexplained until it was found that they accord with Perrin's theory. When such exposure is made we first observe a more intense emission at those points where certain infra-red rays of a suitable wave-length fall upon the substance, but in these same areas the phosphorescence is more quickly extinguished so that they quickly become black, in contrast to those parts of the preparation which have not been exposed to the infra-red ray.

Another manner of augmenting the intensity of the infra-red consists in raising the temperature. Behind a stream of calcium sulphide which has been previously exposed to sunlight we placed a rectangular plate of sheet iron heated to about 100° C. That area of the screen opposite the sheet iron becomes far brighter than the neighbouring areas. But after a very short time their stored up light is exhausted and they become black.

The development of M. Perrin's theory promises to be of great value in science. If these new ideas are correct, and it must be admitted that these primary verifications recited constitute a strong presumption in their favour, it is impossible to doubt that the knowledge thus gained of the actual mechanism concerned in chemical reaction must have a profound influence upon the development of both pure and applied chemical science.

Selective Heating.

We can readily imagine, indeed, a state of development of our chemical knowledge in some future day when, instead of making a crude use of the entire spectrum of radiations yielded by a given temperature, in which case certain ones of these rays produce the desired reaction, while others, on the contrary, produce the opposite reaction so as to partially cancel the effect, while still others produce what may be termed parasitic reactions—instead of this clumsy method, we shall know how to make a definite choice of the precise ray required to produce the given effect.

C

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Sounds of Meteorological Origin.*

By J. W. HUMPHREYS, Ph.D.

Probably all, or nearly all, who have experienced a cold winter are familiar with the cheery cry of the snow as it is pressed against a hard surface by the steel tyre of a wagon, for instance, or even upon a pavement by the heels of one's boots.

When the temperature is just a little below the freezing point, the snow, then in fine condition for snowballing, does not creak, and the track of the wheel is marked by a strip of more or less compact ice. On the other hand, when it is so cold that the snow will not ball, its voice is loud, and the track left by the wheel is now marked, not by a strip of compact ice, but by a trail of crushed and powdered crystals.

In the first case, that is, when the temperature is only a little below freezing, the snow crystals obviously melt, to a greater or less extent, as a result of the pressure to which they are subjected, and undergo regelation as soon as the pressure is removed. The yielding is gentle and progressive through melting and flowing, and not of that abrupt nature essential to the production of sound.

In the second case, however, or when the snow is too cold to melt under the pressure applied, its yieldings and readjustments are abrupt and jerky incident to the crushing of the crystals and their slippage in a dry condition over each other. It is these abrupt yieldings, these sudden breaks and slips of its dry crystals, that produce the familiar cold-weather creak and cry of the snow.

Thunder.

Cause.—Thunder, one of the most familiar and certainly the most impressive of all meteorological sounds, has been "explained" in many ridiculous ways, but generally, perhaps, just accepted. Any careful observation, however, will soon show that thunder is associated with lightning, and that the lightning flash always precedes the thunder. Clearly, then, thunder is somehow caused by lightning.

Now, it is known that sudden and intense heating, and molecular dissociation occur along the path of a lightning discharge. Hence a corresponding abrupt expansion, simulating a violent explosion, also occurs along this path; and this expansion in turn produces a compression wave in the surrounding atmosphere that travels outwards exactly as would any other sound wave.

Musical Thunder.—It occasionally happens, when one is near the path of a lightning flash, that the thunder heard begins with a musical note. This is due to the fact that some lightning discharges—the flickering type—consist of a series of rapid flashes that occasionally are nearly enough regular, and of such frequency, as to produce a quasi-musical note.

Duration.—The long continuation of thunder is due, chiefly, to the great difference in the distances of the nearest and farthest points of the lightning path from the observer. If this difference is five miles, as it occasionally is, the duration of the thunder owing to this cause alone, is roughly 24 seconds.

The duration of thunder is also prolonged by reflexion. Occasionally the echo prolongation is very pronounced, but it is everywhere variable and uncertain.

Rumbling.—The great variations in the intensity of thunder that constitute its characteristic rumbling are due:

(*a*) To crookedness of path. The thunder starts from all parts of the discharge path simultaneously, or practically so, and thus the observer hears simultaneously the thunder from the whole of any portion of the path that happens to be at a constant distance from him. Now, as the path usually is very crooked, it generally happens that many portions of it are at one or another nearly constant distance from any given point. Hence, almost every peal of thunder is of irregular intensity, and as no two lightning paths are alike so also each peal of thunder differs from every other.

(*b*) To the sequence of discharges. Obviously, when a number of discharges follow each other in rapid succession—when the lightning is flickering—there is likely to be more or less interference between the several sound pulses resulting now in partial neutralisation and again in reinforcement, the whole merging into an irregular rumble.

(*c*) To reflexion. Reflexion by mountains, hills and other objects may occasionally be effective in prolonging the noise of thunder and accentuating its rumble. However,

* Abstracted from the 'Journal of the Franklin Institute,'

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"You Cannot SQ Buy Better"

STEVENS' QUALITY
Optical Goods

UNQUALIFIED approval meets this celebrated line wherever introduced.

WE are sole agents for the United Kingdom and can invariably supply your requirements from stock.

One Quality Only—The Best Made

1/10th 12ct. Gold Filled

Specialising in the Fingerpiece Mount

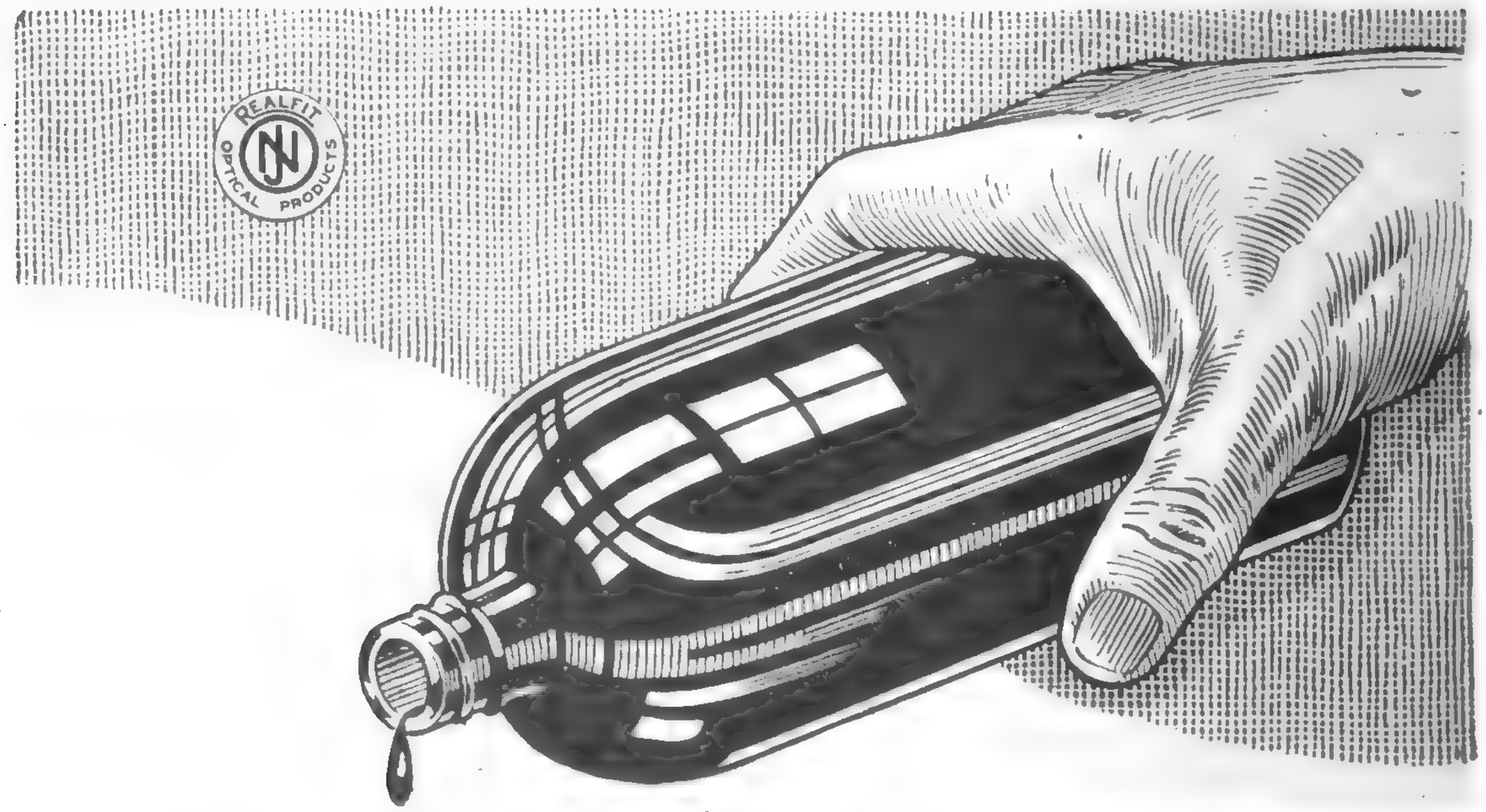
Send us your enquiries for
Spectacles and Eyeglasses—Frames and Mountings

Complete Catalogues on Application

H. WILLIAMSON Ltd.
Optical Section
87/89 GREAT SAFFRON HILL, LONDON, E.C.1

General Optical Supplies—Prescription and Repair Work—
Fittings and Instruments—Optical Machinery

Digitized by Google Original from THE OHIO STATE UNIVERSITY

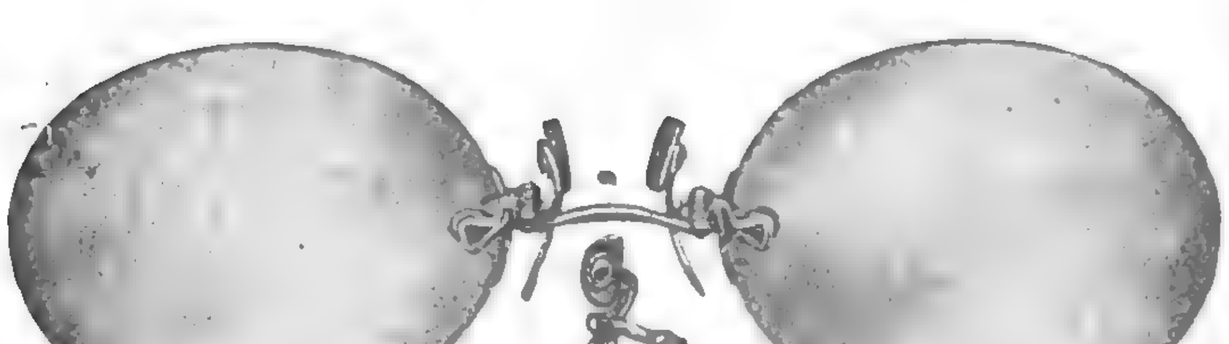




REALFIT

Finger Piece

Mountings and Frames.



The hand of Time applies the acid test to merchandise and men. Many are found wanting; they fall by the wayside. A few possess that element which men call QUALITY. Time cannot efface their greatness.

REALFIT Finger Piece Frames and Mountings are Quality products. Whether you buy to-day or next month, *always* you can be certain of their uniform high standard—of their comfort, beauty and enduring strength.

The best material is used throughout. Every part of the mounting is constructed with great precision.

No less than five inspections testify to the care exercised that no REALFIT should leave our factory unless it is absolutely perfect.

Made in all standard sizes with a complete assortment of Guards. If your Wholesaler cannot supply you, write us.

NEW JERSEY OPTICAL Co.,
Newark, N.J. . . . . U.S.A.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

mountains and hills are not nearly so essential to the rumble of thunder as occasionally they are said to be, for the rumble of the thunder, whether in the valley, on the plain or on the peak, is substantially the same.

Distance Heard.—Thunder seldom is heard more than 15 miles. This is much less than the distance to which cannon are sometimes heard. The circumstances in the two cases, however, are radically different. Thus, the sound energy from the cannon is relatively concentrated since it all starts from a single point and spreads out in a hemispherical shell, whereas, that of thunder starts, not from a single point, but from a crooked line often miles long. Furthermore, cannon often are fired when the surface air in which the firing occurs, is very still and otherwise in the best state for long transmissions of sound. Thunder, on the other hand, seldom occurs except when the winds are turbulent and the general conditions very adverse to sound propagation. Finally, the density of the air is greater at the cannon than along the lightning path, and hence its sound energy per unit volume, other things being equal, is also correspondingly greater in the former than in the latter case.

Brontides.

From time immemorial low, rumbling, thunder-like noises (brontides, *mistpuffers*, "Barisal guns," etc.), of short duration, and that certainly are not thunder, for they often occur when the sky is clear, have been heard in many parts of the world, both singly and in irregular series. They appear to come from a distance, but of uncertain direction, and are most frequent in actively seismic regions.

Apparently, then, the true brontides (many other sounds have often been mistakenly reported as brontides) are only the rumblings of earthquakes too feeble for registration or other than aural detection. And this inference is strengthened, if not indeed confirmed, by the fact that earthquake adjustments have been known to occur in a long irregular series of shocks that became feebler and feebler until only the characteristic low rumbles (then properly called brontides) remained, as presumable evidence of their passage.

Howling of the Wind.

One of the compensations for being snowbound on a windy day is the pleasure of listening to the howling of the wind as it sweeps by the chimneys and over the gables, and wondering where it gets its many voices, or, indeed, any voice at all. Nor is the wonderment yet over, for the problem of the howling of the wind has never been completely solved at least not in the fullness of all the differential equations that tell the whole story. This much, however, is known; the howling, like the other æolian sounds discussed below, is due to eddy motions in the atmosphere immediately beyond the obstructing object. There is no resonance or other organ pipe action, for the change from one pitch to another is not by jumps, as it is in all pipes, but gradual.

Let the direction of the wind make an appreciable angle with the roof and let the latter either project a little beyond the gable wall or, at least, come up flush with it. Under these conditions the wind will have its maximum velocity as it leaves the roof, and there in only a comparatively thin sheet. This sheet in turn, immediately on escaping the roof, drags along, through viscosity, some of the air just beneath it, and is itself slightly deflected in the direction of the consequent pull. In this way an abrupt change in the direction of flow is produced at the edge of the roof and hence an eddy will immediately start at that place. One effect of such an eddy, since it enters the current from relatively still air, is to decrease slightly the velocity of that current. It is quickly carried on, however, and the eddy-forming conditions are thereby renewed. In this general manner, presumably, eddy after eddy is formed at the edge of the roof with such frequency and such approach to regularity as to produce a more or less musical note.

These sounds generally are much better heard indoors than out. This is largely, if not wholly, because one is there far less disturbed by the innumerable other outdoor noises, especially the continuous and annoying whisper of the wind right in one's ears—also an eddy effect.

Humming of Wires.

Few things, perhaps, have been more absurdly "explained" than has the well-known humming of telegraph and telephone wires, and that in spite of the fact that the correct explanation has long been at hand.

It was shown by Strouhal [1] that wind normal to a cylinder, such as a stretched wire, produces æolian tones even when the cylinder itself takes no part in the vibration; that the pitch of the note thus produced, independent alike of the material, length and tension of the wire, varies directly as the speed, u, of the

[1] 'Ann d. Phys.,' p. 216, 1878. See also Lord Rayleigh, 'Phil. Mag.,' p. 433, 1915.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

wind and inversely as the diameter, d, of the obstructing rod; and that the number, n, of such vibrations per second is given, approximately, by the equation

$$n = .185\ u/d$$

the units being the centimeter and second.

Whenever the tone thus produced coincides with one of the proper tones (fundamental or a harmonic) of the wire, the wire itself, if suitably supported, then vigorously vibrates, normal to the direction of the wind, and thereby increases the loudness and also holds the pitch fixed over a considerable range of wind velocity. The sound in question, however, that is, the humming of telegraph and telephone wires, is not due to the elasticity of the wires (the pitch changes gradually with wind velocity and not from harmonic to harmonic), but to the instability of the vortex sheets their obstruction introduces into the air as it rushes by them. This obvious and, indeed, unavoidable deduction from Strouhal's experiments, just referred to, is abundantly confirmed by photographs of water eddies, due to flow past a cylinder, made at the National Physical Laboratory. Vortex whirls developed at regular intervals, alternately to the right and left of the interfering cylinder, while the eddy mass vibrated from side to side in the same period.

The complete mathematical analysis of these and similar vortices, giving the deduction of Strouhal's rules, and many others, would be both interesting and valuable, but it appears that this important problem has not yet been fully solved. Much progress, however, towards this solution, has been made by v. Kármán [2] and by v. Kármán and Rubach,[3] who have shown that evenly spaced vortices alternately on opposite sides is a stable arrangement, and the only one.

It is well-known that the humming of telegraph and telephone wires is loudest when the wires are tightly stretched, as they generally are during cold weather. This appears to be because the eddies thus produced in the wind vary the tension on the wire, and rapidly the more so the tighter, or straighter, it becomes. Now these variations of tension are transmitted to the posts which in turn act as sounding boards, analogous to the sounding board of a piano, and hence largely increase the volume of the sound, whatever its pitch.

Whispering of Trees.

From the experiments of Strouhal, above referred to, it is evident that pine needles, bare twigs, and even the branches of trees, must all produce æolian notes—that trees must have voices, even voices that are characteristic of the species. And they do. The muffled plaint of the oak at the wintry blast, for instance, has but little in common with the sibilant sigh of the pine. And the reason is obvious; the twigs and branches of the one, because relatively large and of many sizes, produce a multitude of low tones, while the innumerable fine needles of the other give a smaller range of high-pitched notes.

It may be granted that, as shown by experiment, each twig and other similar obstacle in the wind must produce an æolian note. But how, one must ask, do a multitude of such notes blend together—how are the pitch and loudness of the resultant related to the like properties of the constituents?

[*The author here give a mathematical demonstration which arrives at the following conclusions.*]

From the above two laws, namely, (1) that the pitch of a composite note is the approximate average of those of its constituents, and (2) that the mean intensity is the sum of the individual intensities, it appears (*a*) that the pitch of the æolian whisper of a tree is essentially that of its average twig, or needle, if the tree be a pine, and (*b*) that though the note of the twig may be inaudible, even at close range, the tree may often be heard some distance away.

Just as the æolian whispers of the myriads of needles on a single pine tree, or of the numerous twigs on an oak, for example, blend into a whisper of the same average pitch but vastly greater volume, so too the whisperings of a great many individual trees merge into the well-known murmur of the forest.

Roaring of the Mountain.

When a mountain well wooded along and near its top is crossed by a wind approximately at right angles to its axis, it often happens, particularly during winter when there are no protecting leaves on the trees (or at any time if the forest is pine), that, in the leeward valley, one hears a low sighing or moaning noise which, as the wind over the crest grows to a gale, gradually swells to a cataract roar. This, too, is only another instance of the combined effects of myriads upon myriads of æolian whispers, accentuated, indeed, along the valley through their crude focusing by the descending winds.

Odds and Ends.

In addition to the above, there also are

[2] 'Göttingen Nachrichten,' 1912, 'Heft,' p. 547.

[3] 'Phys. Zeit.,' p. 49, 1912.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Seven Styles

now made in

"OCENTRIC"

EYEGLASSES

BRITISH MADE.



A Distinctive Model for Each Individual Taste.

RIMLESS MOUNTS & FRAMES. G.F. & SOLID GOLD.

0 series Short Plaquets Regular pattern
100 „ Normal Plaquets Regular Pattern
200 „ Long Plaquets Regular Pattern
300 „ For Centrally Drilled Lenses
(BENT UP PLAQUET ENDS.)
400 „ For Centrally Drilled Lenses
(CLAMPS ATTACHED BY SHORT BRACKET.)
700 „ For Centrally Drilled Lenses
(SWAN NECK BRACKETS.)
800 „ Regular Pattern with Double Straps

SAMPLES and PRICES WILLINGLY ON APPLICATION.

The British Ocentric Optical Co., Ltd.,

Wholesale and Manufacturing Opticians,

12 & 13, EAGLE STREET, SOUTHAMPTON ROW,

LONDON, W.C. 1

Telegrams—Ocentricco, Westcent, London. *'Phone—Holborn 560*

Cables—Ocentricco, London.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

DUPAUL, YOUNG OPTICAL CO.,

SOUTHBRIDGE, MASS., U.S.A.

The "ONLIWON" GOLD FILLED INNER RIM ZYLO FRAME.



WE claim we have the ONLY ONE of this class of frame that is scientifically and mechanically perfect in construction.

The most important feature of the "ONLIWON" FRAMES is, the way outer Zylo rim is drawn and closed over the gold filled inner metal rim by a mechanical process known as "crimping," which means curling, turning, drawing, pressing, squeezing. Burnishing one over the other by heat and pressure, thus firmly clamping it securely to the now imbedded inner metal rim, without screws, rivets or clamps.

"ONLIWON" Frames can be formed to any desired shape of eye without the two rims separating.

"ONLIWON" Frames have thin, inconspicuous rims and are not clumsy or showy.

All our Bridges have a Rounded Base at Shank.

Which absolutely prevents the Breaking or cracking of the gold shell of the filled metal during the process of shaping them to size, which is distinctly a Dupaul, Young Optical Company feature on all our frames.

The special KANTFEEL TEMPLES used on "ONLIWON" FRAMES are so made as to almost totally eliminate their breaking at the end-piece.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"BISHOP EYEGLASS CHAINS"

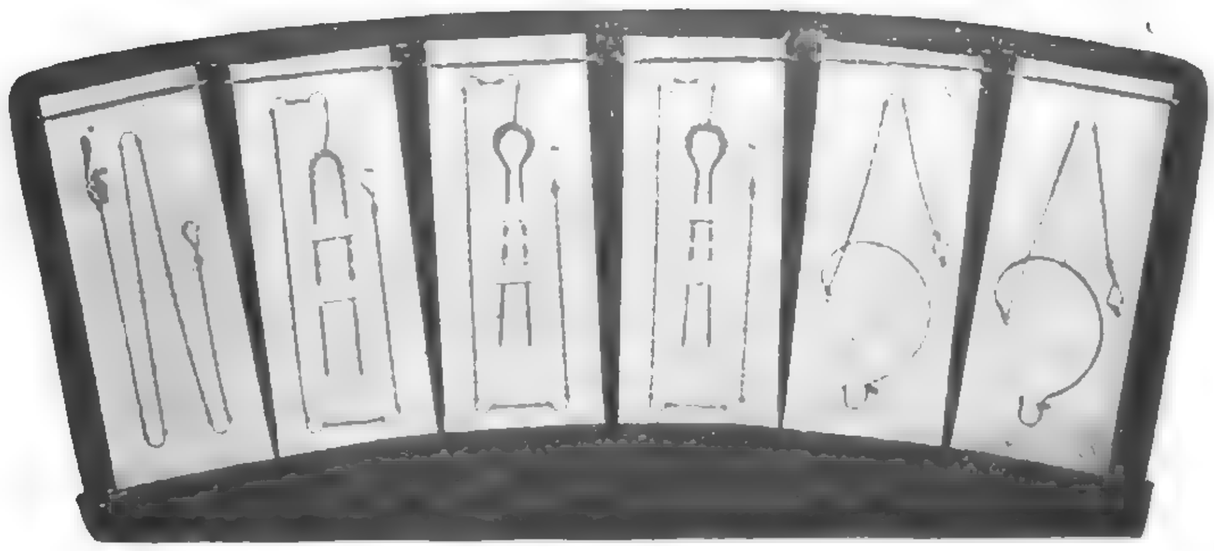
In Gold and Gold Filled

ALSO

SILK EYEGLASS & MONOCLE RIBBONS

are well known to the OPTICAL TRADE and have always been known to give satisfaction. Quality and Finish are evident in all goods of Bishop manufacture and the Bishop trade mark on all chain cards and boxes is your guarantee of absolutely dependancy.

Avoid substitutes, let "BISHOP CHAINS" be your standard of Quality.



THE BISHOP COMPANY,
North Attleboro, Mass.,
U.S.A.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

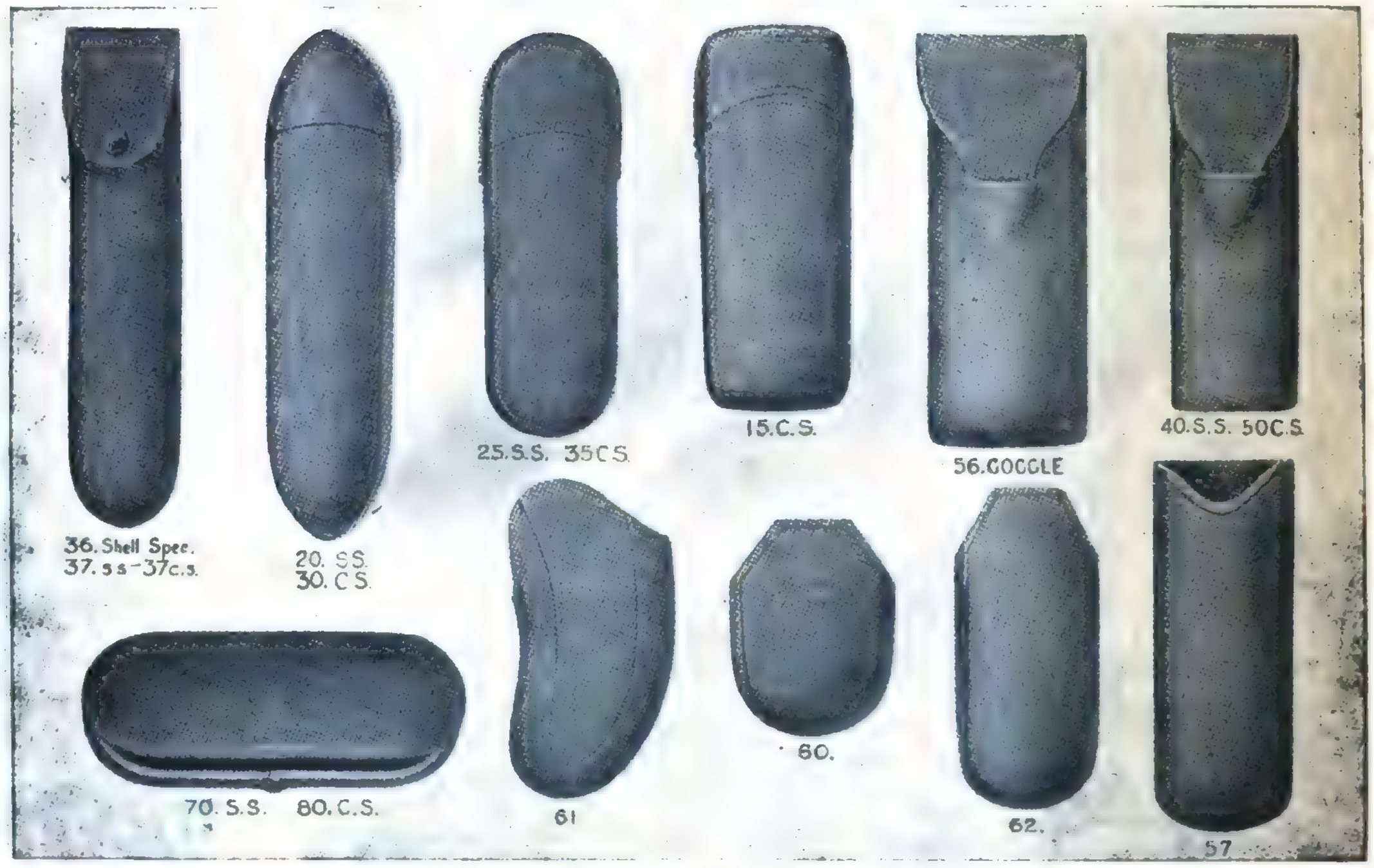
WHOLESALE TRADE ONLY.

W. Smythe & Co. Ltd.

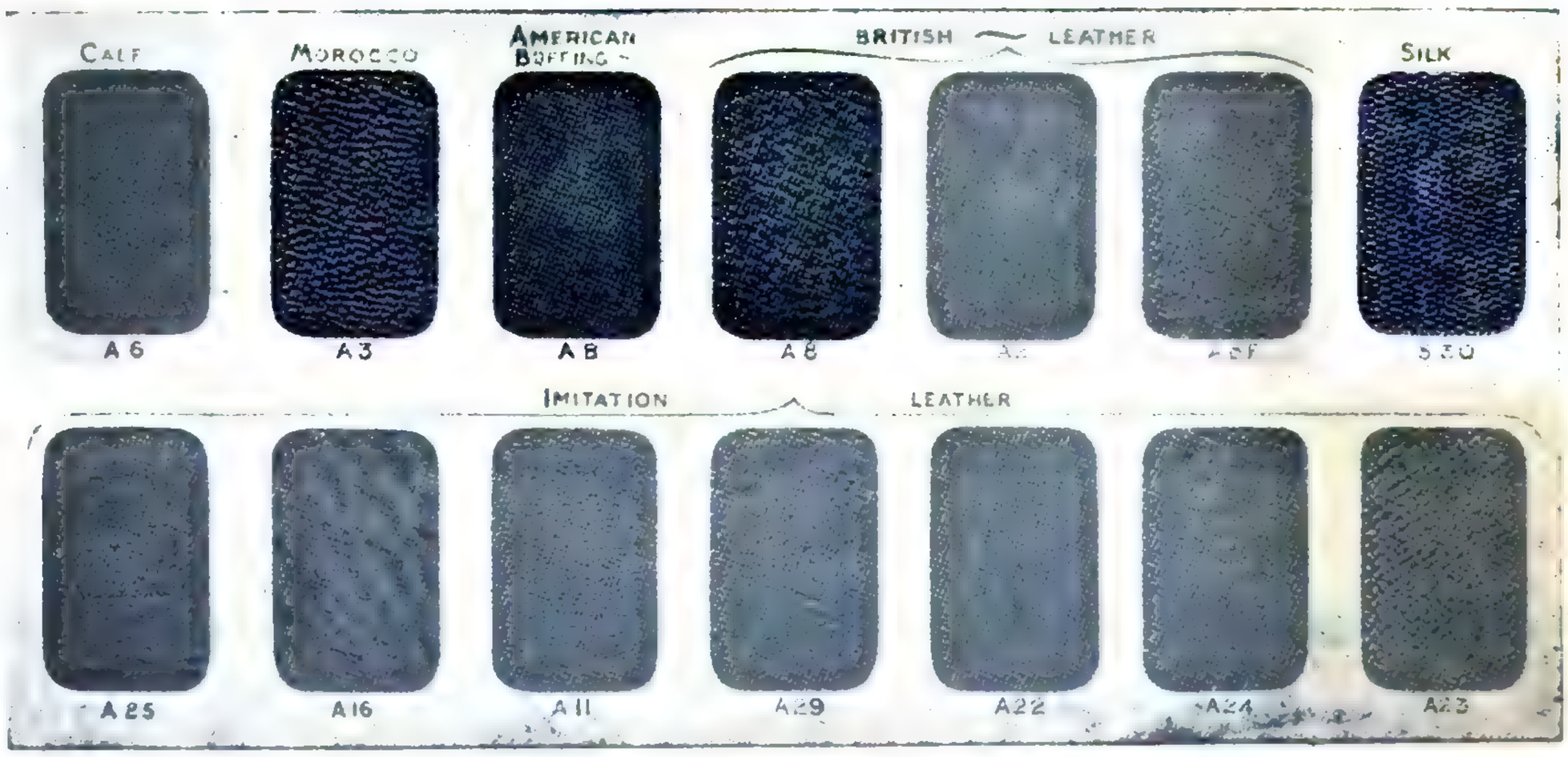
Head Office:
66 and 67, EDWARD ST. PARADE, **Birmingham**

Branch Works—HOCKLEY AND WALSALL.

Patent Optical Case Manufacturers



ALL OUR GOODS CAN BE COVERED WITH THESE MATERIALS AND VELVET.



ILLUSTRATIONS HALF-SIZE. COMPETITIVE PRICES

Also Makers of Patent Spring Lid Cases "NOWATE" Write for List and Prices.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

numerous other sounds that might, more or less justly, be called meteorological, such as the *rustle of leaves*, due to the rubbing together of the foliage as trees and branches are shaken by the wind; the *roar and whirl of the tornado*, due to the wrecking by the storm of things in its path, to the wind eddies engendered by every obstruction, and to the more or less continuous rumble of thunder; the *patter of rain*, due to the successive falling of innumerable drops on to a roof, pavement, compact soil, and the like, or into a body of water; the *rattle of sleet* (frozen raindrops), due to the driving of the small ice pellets against any hard object - the windowpane, for instance; the *clatter of hail*, due to the fall of relatively large lumps of ice upon a roof, or other hard surface, and even (occasionally reported in connection with severe storms) to their striking together in mid-air; the *detonations of meteorites*, due to violent disruptions owing to their sudden and intense heating; the *sizzle of St. Elmo's fire*, the faint crackle of the constant stream of feeble electric discharges from mast tips or other points thus strangely illuminated; the *swish of the aurora*, due, apparently to auto-suggestion, and, of course, many more.

Note on the Determination of the Relative Expansions of Glasses.*

By F. E. WRIGHT.

The most direct method for the determination of the state of strain or annealing in a glass sample is that of polarised light. This method is in general use and is in every way satisfactory both for laboratory and for works purposes; it can be learned in a short time by a factory hand and is readily applied. The apparatus required is not complicated nor easily put out of adjustment. There are, in fact, few methods of test which compare with this for simplicity and effectiveness.

It may not be generally realised that the method can be applied with equal success to the determination of the relative expansion of two glass samples. A test for relative expansion is useful in case it is desired to fuse two different kinds of glass together; thus, in the manufacture of bifocal spectacle lenses a button of medium flint glass is fused to a lens of spectacle crown glass; in chemical apparatus different types of glass are joined together or a metal filament is carried through a glass seal as in electric lamp bulbs. In the case of cords or striæ in glass it is important for the glass-maker to ascertain the cause of the cords, whether pot-solution, or surface film, or lack of homogeneity in the batch, etc., he is able, by ascertaining the relative refringence and the relative expansion of cord and surrounding glass, to infer with some degree of assurance the chemical composition of the cord.

In the present paper the mode of applying the strain-birefringence method to problems of this sort is outlined briefly.

Let us consider first the case of a cord in glass. The cord is a streak of slightly different composition and of correspondingly different expansibility. If the cord has a greater expansion co-efficient than the enclosing glass, then, on cooling down from a high temperature, it tends to contract faster than the main glass mass; this tendency is, however, opposed by the more slowly contracting adjacent glass, with the result that the cord reaches room temperature in a state of radial tensional stress. *Vice versâ*, a cord with lower expansibility than the adjacent glass is compressed by it during the cooling and reaches room temperature in a state of radial compression. The effect exerted on transmitted light-waves by a body under radial compression is different from that exerted by the same body under radial tension. From this optical effect it is possible to determine the state of stress in a body and thus, in the case of a cord embedded in glass or of two glasses fused together, to infer their relative expansibilities for the temperature interval 20° C to the upper limit of the annealing range (400° to 650° C. depending on the type of glass).

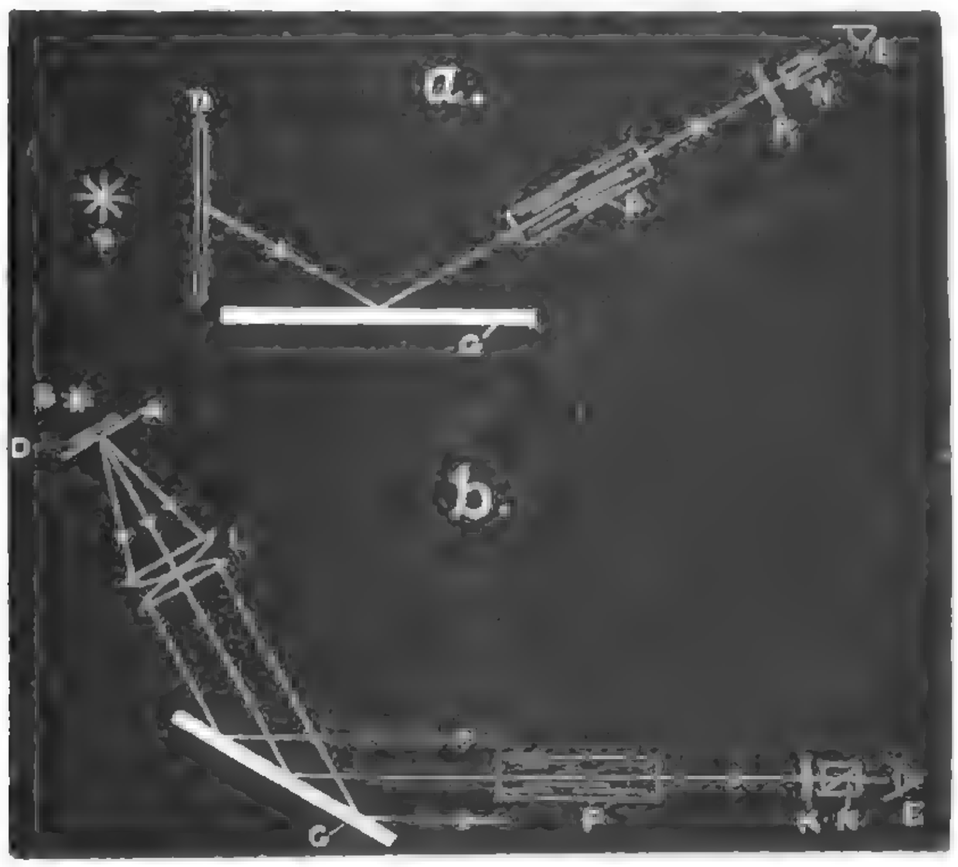
The apparatus required is essentially that employed in tests for the state of annealing of glass, and is illustrated in fig. 1, *a* and *b*.

To set up the apparatus place the opaque reflecting plate G in a horizontal position or so that the plane of incidence for the rays

* From the Proceedings of the Optical Society of America.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

from the source of light S is the vertical plane. Sight through the analyser N towards S, as seen reflected from G. Rotate the analyser about the line of sight as axis to the position for which the intensity is a minimum. Without further rotating the analyser, raise or lower the line of sight (change the angle of incidence and angle of reflexion) to the position at which the illumination is a minimum. The correct adjustment of the apparatus is more readily accomplished by this method than by actually measuring the Brewster angle of incidence, the tangent of which is the refractive index of the reflecting opaque glass plate.



Apparatus suitable for the inspection for strain in optical glass plates. In fig. 1*a* a diffusion screen of ground glass illuminated from the rear by an electric lamp, is used; in fig. 1*b* the diffusion screen is replaced by a condenser lens system. In both arrangements the lamp is properly housed in a sheet iron box. (*a*) S is the source of light; D, a diffusion screen of ground glass; G, a plate of opaque glass; P, plate of optical glass; K, sensitive tint plate; N, nicol prism; E, the eye of the observer. (*b*) D is a diffusion plate; A, pin-hole aperture; L, a condenser lens; S, G, P, K, N, and E are the same as in fig. 1*a*.

Insert now the sensitive tint plate K (of quartz or of selenite) with its normal in the line of sight and rotate it about the line of sight as axis to the position of maximum intensity of illumination (diagonal position); note that at 45° on either side of this position the plate extinguishes completely and has then no apparent effect on the transmitted rays of light.

Place now the plate P in the line of sight and observe that the interference colours change as the plate is rotated. In a well annealed plate, but little change is seen in the interference colours.

As an experiment hold a well annealed plate P so that its flat surfaces are parellel with the line of sight, but inclined at 45° with the vertical plane. Press now firmly against opposite edges of the plate and observe the changes in the interference colours. The uniform purple colour of the sensitive tint plate is seen to change near the points of application of the pressure either to red and orange or to blue. In case the plate is stretched instead of compressed the interference colours change either to blue or to red and orange; in other words, in a direction opposite to that of the first.

This practical test can be repeated at any time with a given piece of glass and the direction of shift, either up or down the Newton colour scale, can be ascertained for a given kind of load, either compressional or tensional. The observation can be made in a few seconds and suffices to determine whether the strain at a given point in a strained piece of glass is the result of radial compression or of radial tension. In the case of a glass tube or rod it suffices to bend the tube slightly and to note the interference colours on the concave (compression) and convex (dilatation) sides of the bent tube.

Unequal Contraction.

A cord richer in silica than the surrounding glass has commonly a smaller expansibility than the adjoining glass. On cooling down from a high temperature, it tends to oppose the more rapid shrinking of the glass and reaches room temperature in a state of radial compression; tested in polarised light it exhibits the distribution of interference colours, characteristic of glass under compression. A cord richer in alumina (pot solution), on the other hand, may have a greater expansibility than the enveloping glass and hence cools in a state of radial tension.

An interesting example of strain distribution is exhibited in the glass adjacent to a "stone," especially a crystallisation body in glass. The crystallised material may contract at a faster rate than does the glass; the glass adjacent to the stone is in a state, then, of radial tension and the characteristic distribution of interference colours in the four quadrants for radial tensional stresses can be seen. The intereference colours rise in two opposite quadrants and fall in the two remaining quadrants, the central cross exhibiting the purple colour of the sensitive tint plate.

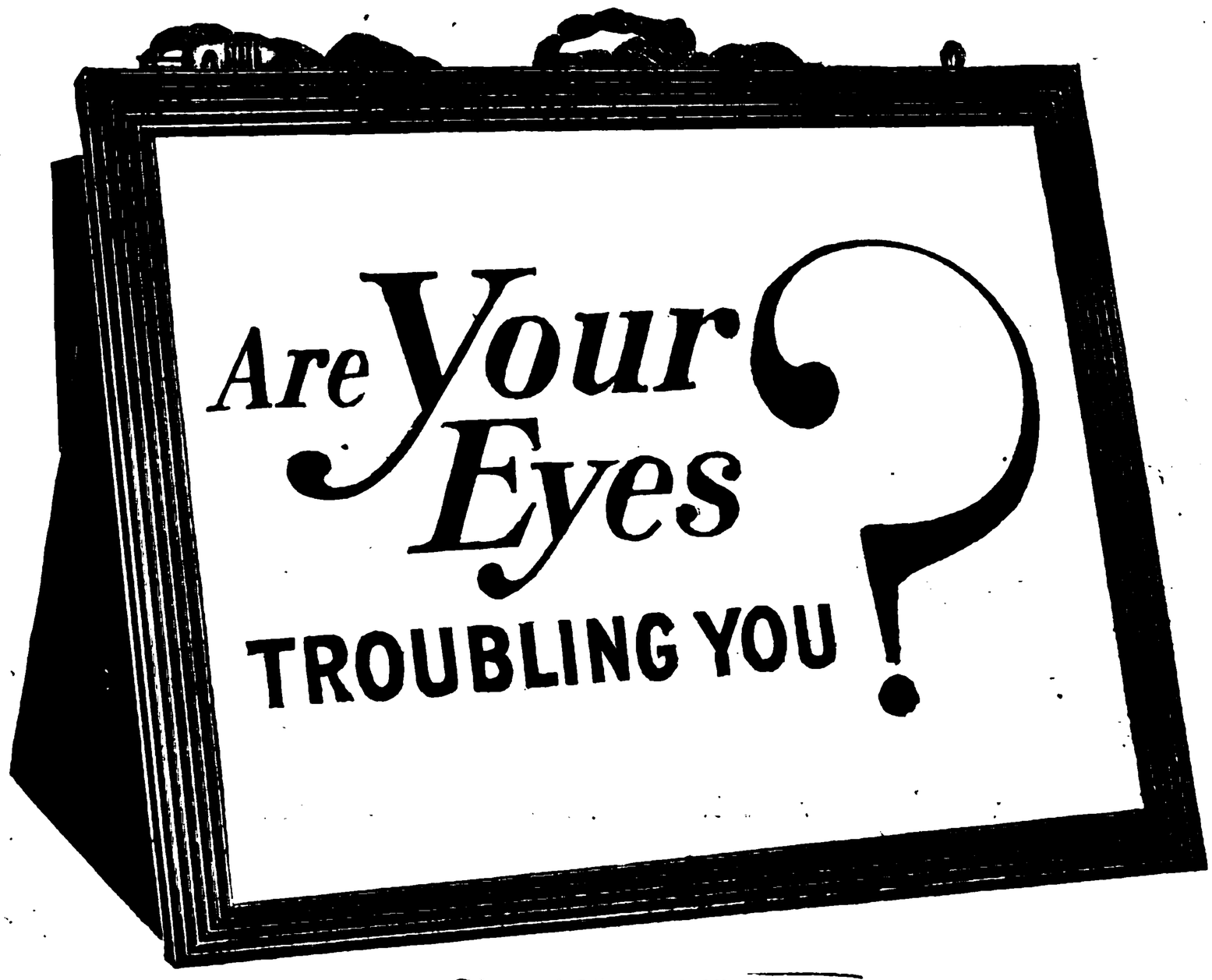
No rule has been given thus far for ascertaining the character of the stress from the interference colours alone. A statement of the rule has been purposely avoided because a

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

IT COMPELS ATTENTION.

The "GENOCO" Electric Flashing Window Sign.

Brings increased business to the Optician.



Size 13" x 11" x 9"

This sign is designed for use inside the Optician's window, and is supplied complete with 4 interchangeable Framed Opal plates.

The plate shown in the illustration is in 2 colours, for when the plate is illuminated from the back, the words, "If so, Consult us" shew up in red lettering inside the question mark.

The other plates are in black and red lettering on opal, and worded as follows:

"Repairs to Spectacles and Eyeglasses quickly executed."

"Oculists' Prescriptions carefully filled."

"The Best is always the cheapest in the end. Crookes lenses are the acme of perfection. Wearing these ensures comfort."

One unique feature of this sign is in the fact that when the plates are not in use on the sign, they can be hung up round the waiting room or shop, to continue their work of impressing their message.

Wired for any voltage. Special plates can be made to order.

Price on Application to

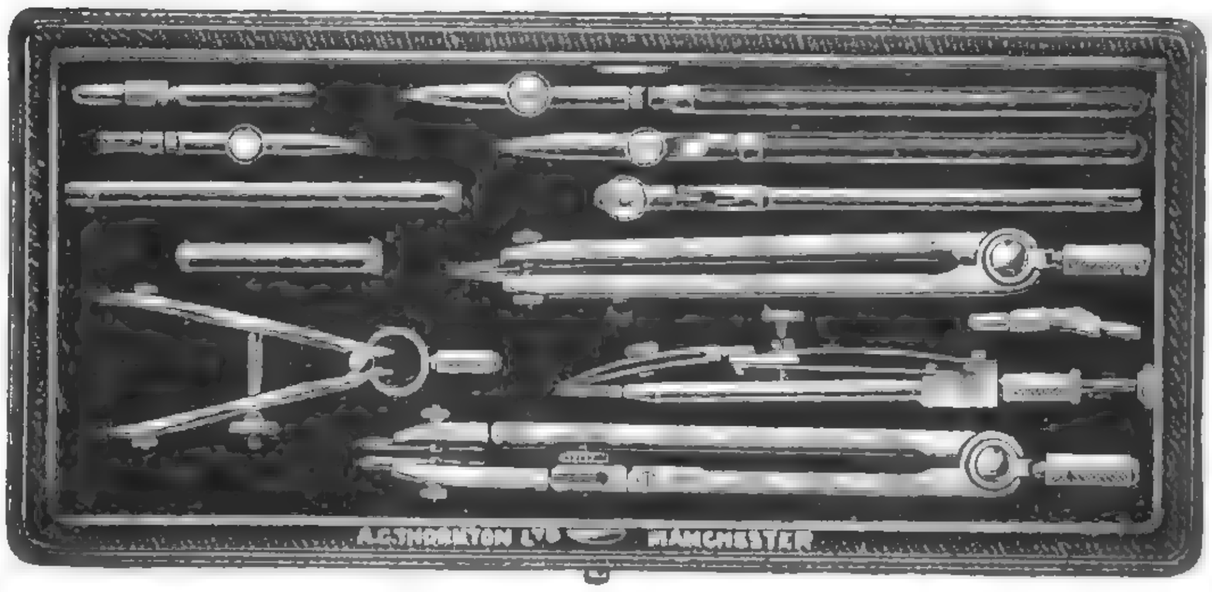
THE GENERAL OPTICAL Co. (E. T. & F. W. Cornwell),

31 & 32, ELY PLACE, HOLBORN, LONDON, E.C. 1

Telephone: 615 HOLBORN. **Telegrams: GENOPTICO, SMITH, LONDON.**

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

BRITISH MADE DRAWING INSTRUMENTS



Pocket case of Show Instruments, from 18/9 each.

SPECIAL TERMS TO THE TRADE.

Produced in our Factory at Manchester.

A. G. THORNTON, LTD.

Contractors to the British, Colonial, and other Governments.

PARAGON WORKS, 20, KING ST., WEST, MANCHESTER.

Rx

SANDRO LOWY

Optical Rx Specialist,

88, Goswell Road,

LONDON, E.C. 1

Telephone: CITY 304 (two lines)

Telegrams: SANOPTIC, LONDON

Rx

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

number of factors are involved and the practical test can be carried out so easily that in many instances it is better to make an actual test by pressing or bending a glass plate rather than to trust to the memory for the exact wording of the rule. Suffice it to state that glass under compressional load behaves optically as a negative uniaxial crystal, the principal axis of the crystal coinciding with the direction of the applied load. A plate held so that the polarised light is transmitted along a direction normal to the acting pressure offers different degrees of resistance to transmitted waves of light, depending on the direction of their vibrations, whether in, or normal to, the direction of the applied load.

Optical Measuring of Stresses.

Thus for most glasses the waves whose vibrations are normal to the line of pressure (principal axis of the optically negative, uniaxial crystal) travel more slowly in the glass than do the waves whose vibrations are parallel with the axis. As a result the faster wave emerges from the glass a short distance ahead of the second wave; the distance between the two waves is called the path-difference. Brewster discovered over a century ago [1] that in glasses the relation between the load and the resulting path difference is linear, so that the optical path-difference per unit length glass path may be taken as a direct measure of the internal stresses.

Path-difference is measured by means of a plate or wedge of a crystal in which the two directions of vibration and the relative speeds of propagation of the two transmitted waves of light are definitely known. On inserting this plate (sensitive tint plate K) or wedge in the line of sight, the path difference produced by the strained glass plate is increased or decreased; from the rise or fall of the interference colours thus obtained, the relative speeds of the two waves transmitted through the strained glass plate can be determined. This operation can be done in a moment and the desired information ascertained regarding the relative expansion of the two glasses.

The determination of the relative expansions of two glass samples.—For the solution of this problem by the strain-birefringence method it is necessary to fuse or weld the two samples together; in case the expensibilities of the glasses are greatly different the surface of fusion contact must be small, otherwise fracturing results. The glass samples may be in the form of rods, tubes, plates or irregular fragments. The mode of procedure differs somewhat, depending on the shape.

Let one of the glass samples be a glass tube 2 or 3 mm. in diameter. Insert a small fragment of the second glass sample, 0.5 to 2 mm. in diameter, into the tube to a point several millimeters from the end. Insert the end of the tube into a blast lamp flame and fuse it to a rounded end with the small glass fragment included in the molten glass drop. Allow the glass to cool slowly through the annealing range by holding it first in a yellow smoky flame and then by cooling it in layers of cotton. After the rod has cooled down to room temperature it can be examined for strain. In this connection a small liquid immersion cell filled with a liquid of about the same refractivity as the glass may be used to eliminate the disturbing surface effects of the glass rod. The rod is immersed in the liquid and examined in polarised light. Note the distribution of interference colours after insertion of a sensitive plate in the diagonal position. If the included glass fragment has the smaller co-efficient of expansion, it is then in a state of compression.

In case the second glass sample is in the form of a glass rod or tube draw it out to a thin rod or thread and insert a short length in the first tube. Fuse down tube and rod and note the distribution of interference colours.

A Glass Pyrometer.

If two glass rods are available weld them together either end to end or side to side; if side to side draw out the molten double layer end with a pair of pincers to a long thread and note that the double layer thread, on cooling, curls up with the glass of greater expansibility on the inside.[2] Examined in polarised light the glass with the lower expansibility (convex side of thread) is seen to be in a state of tangential compression; the concave side (greater expansibility) is in a state of tangential tension. From the degree of curvature of the thin, double layer thread or from the interference colours produced, the relative expansibilities of the two glasses can be inferred directly.

Similar interference phenomena are produced when two different glass plates or lenses are welded together, as in the bifocal spectacle lenses.

[1] 'Philosophical Transactions,' 1813.

[2] O. Schott; 'Verein zur Beförderung des Gewerbefleisses,' 4 April, 1892, p. 11; See also H. Hovestadt "Jena Glass." Translation by J. D. and A. Everett, p. 225, London, 1902; D. E. Sharp; 'J. Am. Ceram. Soc.,' 4, p. 219-223, 1921.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The approximate numerical value of the coefficient of expansion of an unknown glass or of a small crystal fragment or of a metal wire can be determined by means of a set of glasses of measured expansibilities. Small fragments of the material of unknown expansibility are welded or fused into a glass piece of known expansibility and the relative expansibility is compared by the strain-birefringence method.

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

Visual Equivalence of Lenses.

Sir,—Mr. William Swaine promised us on the 22nd July, 1921, to prove that "equivalence for near vision is equality of amplitude of accommodation." In his recent letter to the Editor (30th December, 1921), he seems to renew his promise. As I am eagerly interested in the question and quite willing to acknowledge any truth positively elucidated, I should be grateful to Mr. Swaine if he would kindly decide not to let us wait too long for his demonstration. Thus he would prove, better than with words, that he places scientific investigation before personal elements.

E. Mayer.

Paris.

Useful Propaganda.

Sir,—An interesting article* entitled, "Eyesight and Health," appearing in the 'Daily Express' to-day should prove beneficial to the oculists and opticians throughout the country, as it brings the importance of eyesight before the public, and should cause many sufferers to make that belated resolution they hesitate to make, viz., "To see an oculist or optician." I would suggest the optical profession could do the nation good by advertising on similar lines to the article referred to.

S. C. Quick, M.B.E.

90, Lewisham Road, S.E.13.

* Reprinted in last week's *Optician*, p. 301.

Handbooks Relating to Scientific Instruments.

Sir,—I shall be much obliged if you or any of your numerous readers will let me know through the medium of your paper, the titles and publishers, of any books dealing with scientific instruments.

I recently purchased a copy of the Dictionary of British Scientific Instruments, but it is not exactly what I require.

Just what I want are books dealing with the theory, use, construction, adjustment, repair, etc., of such instruments as surveying, nautical, meteorological instruments, telescopes and range-finders.

I am frequently asked to lecture, and like to do something with a view to the educational side, as most of the audience is composed of officers and men of the army.

I do not require a deep mathematical publication but something practical and at the same time a little deeper than the work usually done for the F.S.M.C. Diploma.

W. R. Bone.

Bruce Road, Quetta, Baluchistan.

The Proposed Optical Panel.

Sir,—In *The Optician* of 16th December last, I read with interest the article by Mr. H. Smith, and the article by "John," *re* the above proposed panel, and in *The Optician* of 30th December, the articles of Mr. F. R. Paxman, and "Yorkist." May I be allowed now to give my opinion in brief on the subject.

I am a qualified sight-testing optician, and believe myself to be a thorough refractionist; and I am sorry to say that the fee arrived at by the various optical bodies and the N.I.B.S. is not a satisfactory remuneration for the services of a professional optician. However, the time has come when the ophthalmic optician, in rank with other professional men, should have his share of the national health work of the public, and I am of opinion that this proposed insurance work, is the first step in this direction, even if the fee is small at the commencement—as an expert optician suggested to me the other day, the work will mean much more when in full swing, than what it looks at the moment, as most cases will want a better quality article, and will not hesitate to pay extra for that.

Moreover, it has been the constant cry of the optician to obtain proper recognition as a person specially qualified to test sight—Now, this proposed optical panel is what I consider a distinct advance in this direction, and if re-

Digitized by Google Original from THE OHIO STATE UNIVERSITY

IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY.

South Kensington, S.W.7.

Department of

OPTICAL ENGINEERING AND APPLIED OPTICS.

The following courses of weekly lectures will be continued during the Spring Session, 1922:

1. General Optics (Elementary), Professor Cheshire, commencing Wednesday, January 18th, at 4 p.m.

2. Advanced Optics, Professor Cheshire and Mr. L. C. Martin, commencing Monday, January 23rd, at 12 o'clock.

3. Optical Designing and Computing, Professor Conrady, commencing Tuesday, January 17th, at 10 a.m.

4. Advanced Designing and Computing Professor Conrady, commencing Wednesday, January 18th, at 10 a.m.

5. Workshop and Testing Room Methods, Professor Conrady, commencing Wednesday, January 18th, at 2 p.m.

6. Construction Theory and Use of Optical Measuring Instruments, Mr. L. C. Martin, commencing Friday, January 20th, at 12 o'clock.

7. Mechanical Drawing and Elementary Strength of Materials, Professor Pollard, commencing Friday, January 20th, at 2 p.m.

8. Mechanical Design of Instruments, Professor Pollard, commencing Wednesday, January 18th, at 12 o'clock.

The following Special Courses will also be given:—

1. Mechanical Design of the Common Microscope, Professor Pollard, commencing on Wednesday, January 18th, at 6.30 p.m.

2. The Spectroscope and some of its Modern Applications, by Professor A. Fowler, F.R.S. (Professor of Astrophysics, Imperial College) on Mondays, from 6.30 to 7.30 p.m., commencing on January 30th, 1922.

3. Photometry, Mr. L. C. Martin, commencing on Friday, May 5th, at 5 p.m.

For further particulars and for admission tickets apply to Registrar at the above address.

The Mark Dacol *of Distinction*

Only High Grade and High Quality

BINOCULARS

have this mark.

Full particulars from

DAVIES COLEMAN & Co., Ltd.,

45 & 46, Fetter Lane,

London, E.C.4

Telephone: HOLBORN 2597.

J. WHEELER,

55, St. John Street, Oxford.

Wholesale Optician and Manufacturer's Agent.

The cheapest House for B.S.O. Astigs $\frac{1}{10}$ to $\frac{1}{16}$, F/M/Frames, Cables and S/S, $\frac{1}{10}$ and $\frac{1}{16}$, recently purchased from the bank.

We also hold large stocks of Edged and Unedged Lenses; price list on application.

For Wholesale Only.

MANY SUCCESSES IN THE EXAMINATIONS!

Your Opportunity to

QUALIFY IN OPTICS

PRACTICAL WORK. Students taking the Course may receive personal tuition in the practical work AT ANY TIME DURING THE COURSE.

Expert Tuition by Correspondence for the SIGHT-TESTING DIPLOMAS of the Worshipful Company of Spectacle Makers (F.S.M.C.), or the British Optical Association (D.B.O.A.).

Write for full particulars—

C. A. SCURR, M.P.S., F.S.M.C., F.I.O., etc.

64, High Street - - - - BARNET.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

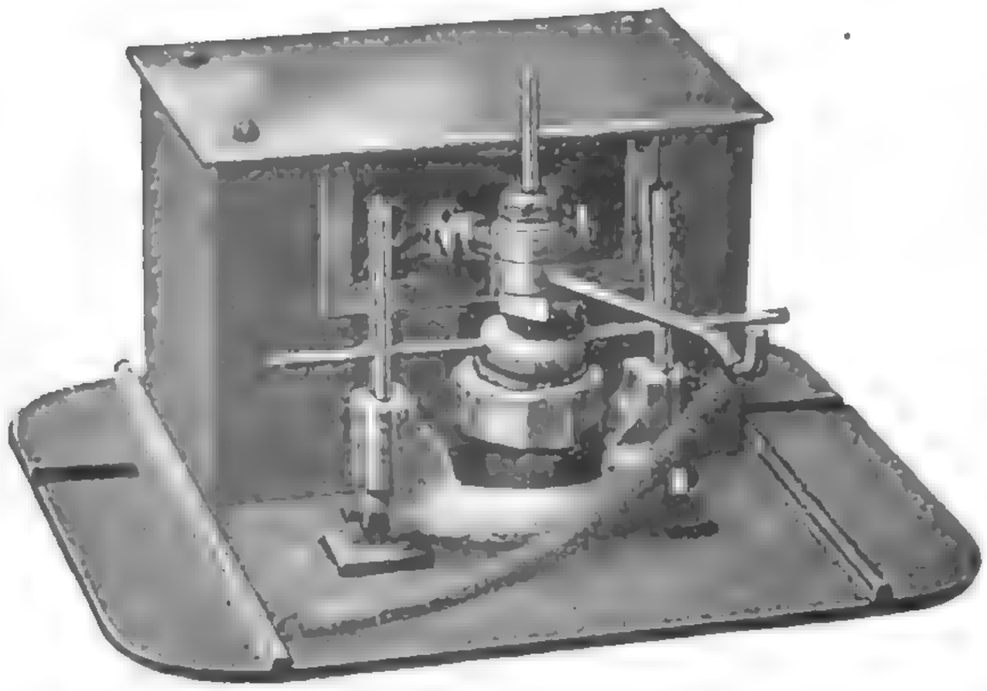
"SOMCO"

AUTO-SURFACING MACHINE.

PATENTED IN
GREAT BRITAIN
U.S.A.
FRANCE
GERMANY.

LONDON
MADE.

Ask for Quotations.



Requires Only 1/6 H.P.

TOOLS
GAUGES
SURFACING
SHOP EQUIPMENT
OPTICAL MACHINERY & INSTRUMENT REPAIRS.

SURGICAL & OPTICAL MFG., Co.,
22, Union Road,
Clapham, London, S.W. 4

ESTABLISHED 1858.

JULES LANG & SON,

Charlton Works,

CHARLTON PLACE, ISLINGTON, LONDON, N.1

Telegraphic Address—
"ASSORTED, PHONE, LONDON."

Telephone : NORTH 2770.
(3 Lines.)

Have the pleasure to announce that they have been appointed by the well-known French manufacturers of Lenses, etc.,

"LA MANUFACTURE GÉNÉRALE D'OPTIQUE,"

LIGNY, FRANCE,

their Sole Agents for the United Kingdom and Colonies.

The wholesale Prescription trade are cordially invited to write or 'phone us for samples of these products, which will give every satisfaction. Send us your enquiries in connection with our usual stocks of

LENSES, FRAMES AND CASES.

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

jected now, will any of my optical brethren please let me know, when shall we obtain recognition?

I earnestly ask all readers to carefully consider the proposal, and I hope that all N.A.O. members will accept it—Scale No. 1—as requested in the letter to members of the N.A.O., published in *The Optician* of 30th December, (p. 283). (I am a member of the National Association of Opticians). By so doing you will be lightening the burden which our Council is bearing, and you will be paving the way for future developments, which will end in the ultimate success of our profession.

DAVID M. HONEYMAN.

Tullyvanis, Drumacrib, Castleblayney.

Early Sight Testing.

Sir,—I call Mr. Braham's letter (p. 292) an amusing "wriggle." When first asked to give particulars of his qualification we were too ungentlemanly and ignorant to be worthy of a reply, and now he is "side-tracking." We are not for the moment concerned with Mr. ——'s qualifications (whoever he may be), or for that matter anyone else's; and the attainments of all the eminent men in the craft are too well-known to be called in question. But when Mr. Braham addresses himself to opticians and tells them he is qualified by examination, they have a right to ask for particulars, and his refusal to give them will be reckoned for what it is worth. Of one thing we can be fairly certain, viz., that his qualifying certificate—if it exists—has not been issued by any recognised authority, or they would scarcely allow him to pursue his present methods. When he descends on a certain town, hires a hall, and announces "So and So and District's Great Day," "Mr. B., the Famous London Eyesight Specialist is Coming, etc.," with all the usual bombast, he slavishly copies the quack methods that we are all so unpleasantly familiar with; and when he advertises "no more high charges," "no more faulty lenses," etc., the opticians in the town he visits and of whom he knows nothing, are apt to resent it. It is just possible that some of them possess higher attainments than he, in spite of his lengthy experience of which he seems inordinately proud. I need hardly say that his advertisements, and those of the same type, do the whole optical profession a great injury and help to drag it down.

A. O. CAPEL.

32, College Road, Harrow.

Messrs. Fleming's New Catalogue.

A new and revised price list of spectacle and eyeglass cases, cleaners, etc., is being issued by Messrs. J. & R. Fleming, Ltd., of 146, Clerkenwell Road, London, E.C.1., and may be had on application. Messrs. Fleming report brisk trade in their case department during the past few months. The latest American machines now used by them for gold blocking, have affected a considerable improvement in the quality.

Messrs. Fleming also announce substantial reduction in their prices of Windsor goods.

A Trader's Microscope.

Fakes are common in almost every trade to-day, and the fur trade may be particularised. The fur of one creature is habitually made to simulate that of another to the prejudice of the purchaser. It is important to know where your fur really comes from, altogether apart from its beauty, because the animals of cold climates produce hard-wearing furs, and those of warm climates, supply the poor-wearing varieties. Recent investigations have proved that a microscopic examination is all that is necessary to identify a fur. The fur of each fur-bearing animal has its own peculiar structural details. They are easy to identify. They are to be found in the shape and arrangement of the scales with which each hair is covered, in the form of the central supporting shaft and in the nature of the colour granules. The fur retailers are ignorant of all this, and often impose innocently on their customers. A little propaganda work might open their eyes to the value of a microscope. Other trades, notably the grocery, might be made wise in similar fashion. There is a concerted movement among grocers to-day to improve their knowledge of the goods they vend.

A Differential Tintometer.

The human eye is not a sensitive instrument for measuring colour, and differences less than about two per cent. are not detected. A "differential tintometer," greatly increasing sensitiveness to colour variations, was described by Dr. A. H. Pfund, of Johns Hopkins University, at a recent American Chemical Society meeting. Colour can be expressed definitely by brightness or amount of reflexion, by saturation or strength, or by the dominant hue—the first two of these factors being ratios or percentages and the third a precise wavelength. In developing an improved colori-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

meter, two dyed skeins were mounted at the end of a track on which a small nitrogen-filled electric bulb was arranged to slide. Light from the two samples was reflected through a colorimeter tube to an eyepiece, and the light source was moved along the track until the two halves of the colorimeter field appeared equal in brightness. Increasing the strength of one sample by twisting it gave increased reflexion, serving to equalise the saturation or strength of the two samples. The samples were then interchanged, and when really equal the field was not affected, but slight differences were made very apparent—the eye's sensibility being doubled by this method. To compare the dominant hues, advantage was taken of the human eye's extreme sensitiveness to a certain hue in the purple, and colour screens gave the required changes to make the light reaching the eye appear purple. The sensitiveness of this tintometer, was demonstrated by the very different appearance of two skeins that an expert dye-tester had pronounced alike.

Safeguarding of Industries Act.

BOARD OF TRADE NOTICE.

The Treasury has authorised the Commissioners of Customs and Excise to waive the payment of duty under Part I. of the Safeguarding of Industries Act in the case of the following, viz. :—

Toys and fancy goods which are dutiable under Part I. of the Safeguarding of Industries Act only as containing dutiable articles as parts or ingredients, and for which Customs entries have not been passed before 1st January, 1922, provided that the value of such dutiable parts or ingredients is shown to the satisfaction of the Commissioners of Customs and Excise to represent not more than 10 per cent. of the total value of the whole article in each case.

Packages containing goods for which relief from duty is sought under this Notice must as a general rule be entered by the importer, or a person holding the usual written authority, on Form 107 (Sale). The Form should include a statement showing in respect of such goods:—(*a*) The descriptions and total values of the articles; and (*b*) The descriptions and values of the dutiable parts or ingredients.

Invoices in support of the declared value of the goods must be produced and should show the separate values of the dutiable parts or ingredients; but for the present, where the separate values of the dutiable parts or ingredients are not thus shown, a declaration that their value does not exceed 10 per cent. of the total value of the article may be accepted provided the Officers of Customs and Excise are satisfied as to the facts.

Messrs. Melson Wingate, Ltd.

NEW BRANCH.

Messrs. Melson Wingate, Ltd., of 30, Wigmore Street, W., and Poole Hill, Bournemouth, have opened a branch establishment at Norwich.

Smuggled Thermometers.

At Tower Bridge Police Court, London, the master of the s.s. "Seresina," Hamburg, was charged on remand with smuggling 800 clinical thermometers of the treble value with duty of £180. Defendant stated the thermometers had been entrusted to him for sale in either Norway or Russia. In answer to the magistrate, witness said he could not explain why articles not intended for the English market should have the English words, "one minute" printed on them. Further questioned, witness said his vessel had no charter for Norway or Russia; but he had heard he might get one. A fine of £150 was imposed, and the thermometers were forfeited.

New Company.

A. G. Burrell & Co., Ltd.—Private Company. Capital, £5,000 in £1 shares (1,500 6 per cent. cumulative preference). To adopt an agreement with "A. G. Burrell and Co." and to carry on the business of manufacturers, installers and repairs of and dealers in systems and installations of all kinds of synchronising or distributing time, and of all master and secondary clocks, dials, batteries, wiring and other appliances, etc. The first directors are: J. W. Molden (chairman), Narbestrong, Coombe Hill Road, Kingston, W. E. Spearing, 51, Bushwood Road, Kew, D. B. Saunderson, Bouridge, Frithwood Avenue, Northwood, Middlesex, and A. G. Burrell, 57, Barkers Road, Netheridge, Sheffield. Registered office: 29, Change Alley, Sheffield.

NOTICE TO ADVERTISERS.—Change of Copy, for display advertisements, must reach us at latest by post on Tuesday morning preceding publication; and for Cover on Monday. Failing any such notification of change, the last previous copy will be re-inserted.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"WERTEX" WILLMOTTS'

LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.



11c 11c

First impressions are important, consequently your Testing Room is made attractive.

Lasting impressions are even more important, so complete a transaction by giving an attractive and lasting case.

Use "WERTEX" Cases.

Details and samples from your dealer or direct from the manufacturers.

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

ENGLAND.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Shur-on Cases

Included among the more than 996 members of the Shur-on family of optical products (Quality Beyond Question since 1864) is a complete and distinctive range of eyeglass and spectacle cases, of every type, material and style—cases which, from design to finish, bear the mark of the master optical craftsmen.

Represented are many grains and shades of leather and Imo leather, including *flexible* goggle cases in tan cowhide and grey suede.

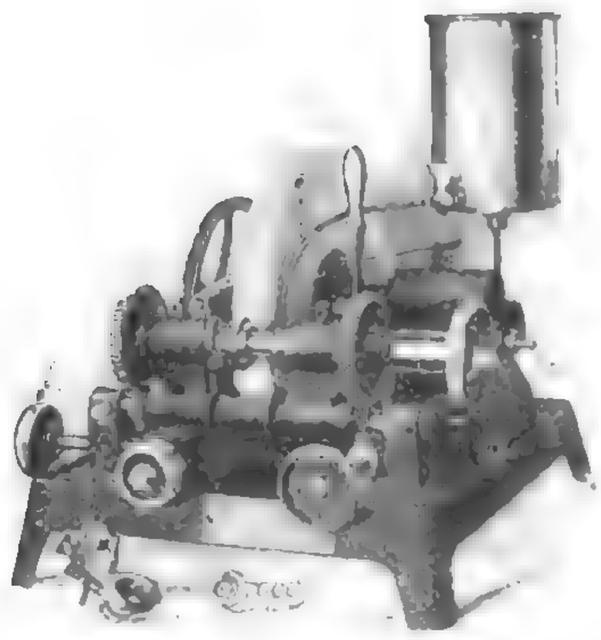
If you *are* particular and are banking on the goodwill and word-of-mouth advertising of your patrons—you *will be* critical and say "SHUR-ON" to your wholesaler.

Shur-on Optical Co.,
Rochester, N.Y. U.S.A.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

FOR THE SMALL SHOP



The Stroco Simplex Rimless Edge Grinder.

All that the Stroco Simplex Rimless Edge Grinder asks is one small corner of your shop—any unused two square feet of space will do. There, without a great deal of skill on the part of the operator and without an undue amount of attention, it will day in and day out turn out work that compares favorably in every detail but volume with the production of many larger machines.

Its sturdy construction and ability to run continuously without showing the strain have made it a favourite unit for battery use in many larger shops. Such use, however, is secondary, the prime purpose of the Stroco Simplex Rimless Edge Grinder being to provide a handy unit for the small shop. If you do not know how handy it is you will be interested in some literature we want to send you.

Manufactured by

THE STANDARD OPTICAL Co.,

GENEVA, N.Y., U.S.A.

Makers of High Grade Frames, Mountings, Lenses and Optical Machinery.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

UNCUT LENSES

OF EVERY DESCRIPTION

QUALITY AND PRICES DEFY COMPETITION

WRITE FOR OUR

LATEST PRICE LIST

OUR RX DEPARTMENT IS UNEQUALLED FOR

PROMPTNESS & ACCURACY

Telephone: HOLBORN 1626 (Private Exchange).

KIRK BROTHERS

WHOLESALE & MANUFACTURING OPTICIANS

Telegrams: KIRKOREX, HOLB. LONDON.

36, GRAY'S INN ROAD, LONDON, W.C.1

Candidates for the Examination of the **Worshipful Company of Spectaclemakers** can always be certain of receiving the most thorough and painstaking preparation at

THE SCHOOL OF OPTICS, LTD.,

Under the direction of Mr. LIONEL LAURANCE (Official instructor to the Company) and Mr. H. OSCAR WOOD.

General Optics, Visual Optics and Sight Testing.

The percentage of successful students AT THE FIRST ATTEMPT is consistently high.

Correspondence Courses, Afternoon and Continuous Day Classes.

Particulars on application to—

2, GUILFORD PLACE, LONDON, W.C.1

THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER

Subscription Form. **123-125, Fleet Street, London, E.C.4., England.**

Send a copy each week of THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER post free for which we enclose .....shillings for.....weeks.

UNITED KINGDOM 17s.

and ABROAD 20s.

Name..... .....

Business.....

Address..... ....

.....

A remittance of 17s. (or 20s. Abroad) for 52 issues includes "THE OPTICAL ALMANAC" post free.

Cheques made payable to The Hatton Press Ltd.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Key to Successful Business is the Trade Paper.

If you advertise, the trade paper gives you a 100 per cent. market; all the readers have a direct business interest in your goods, there is no waste circulation.

If you subscribe, it gives you the latest trade news and technical information. To-day, it is more necessary than ever to be up-to-date in your business; the trade paper will keep you posted. Here are some progressive journals which offer you valuable service as an advertiser, or as a reader.

Aeroplane (London).
Agricultural Gazette (London).
Art Trade Journal (London).
Auto-Cyclist (Sydney).
Automobile Engineer (London).
Auto-Motor Journal (London).
Baker's Confectioners' and Caterers' National Association Review (Lond.)
Bioscope (London).
Box Makers' Journal (Manchester).
Brewers' Gazette (London).
Brick and Pottery Trades' Journal (London).
British and Colonial Mineral Water Trade Journal (Cardiff).
British and Colonial Pharmacist (London).
British Baker (London).
British Builder (London).
British Journal of Photography (London).
Chemical News (London).
China Clay Trade Review (London).
Confectionery Journal (London).
Cooper's Vehicle Journal (London).
Corn Trade News (Liverpool).
Dairy & Creamery Journal (London).
Dairyman (London).
Decorator (London).
Drapers' Organiser (London).
Electric Vehicle (London).
Electrical Industries and Investments (London).
Electricity (London).
Electrics (London).
Engineering Production (London).
Engineering Review (London).
Engineering World (Manchester).
Fancy Goods Record (London).
Fertiliser and Feeding Stuffs Journal (London).
Flight and The Aircraft Engineer (London).
Footwear Organiser (London).
Freemason and Masonic Illustrated (London).
Furnishing Trades' Organiser (London).
Furniture Record and the Furnisher (London).
Games and Toys (London).
Gas and Oil Power (London).
Hardwareman and Ironmonger's Chronicle (London).
Ice and Cold Storage (London).
India Rubber Journal (London).
Indian Industries and Power (Bombay and Calcutta).
Indian Medical Gazette (Calcutta).
Indian Motor News (Bombay and Calcutta).
Indian and Eastern Engineer (Calcutta).
Journal of Decorative Art (Manchester).
Licensing World (London).
"Locomotive" & Railway Carriage and Wagon Review (London).
Managing Engineer (London).
Marine Engineer & Naval Architect (London).
Mechanical World (Manchester and London).
Milling (Liverpool).
Model Engineer and Electrician (London).
Motor Cycle and Cycle Trader (London).
Motor Export Trader (London).
Motor in Australia (Sydney).
Motor Magazine of Canada (Toronto)
Motor Trade of Canada (Toronto).
Motor Trader & Review (London).
Motoring in South Africa (Cape Town).
Motorist & Wheelman (Perth, W.A.).
Music Trades Review (London).
N.Z. Motor Journal (Auckland, N.Z.).
Optician and Scientific Instrument Maker (London).
Organizer (London).
Outfitter (London).
Paper Box and Bag Maker (London.)
Paper Container (London).
Paper Maker & British Paper Trade Journal (London).
Photographic Dealer (London).
Power Laundry (London).
South African Motorist (Johannesburg).
South Australian Motor (Adelaide, S. Australia).
Sports Trades Journal (London).
Stationery World and Fancy Goods Review (London).
Steering Wheel (Brisbane).
Stone Trades' Journal (London).
Sugar Journal, International (London).
Talking Machine News (London).
Textile Manufacturer (Manchester).
Textile Mercury (Manchester).
Textile Recorder (Manchester).
Toyshop and Fancy Goods Journal (London).
Waste Trade World (London).
W.A. Motorist (Perth, W.A.).
Wireless World (London).
World's Carriers' & Carrying Trades' Review (London).

The address of any Paper in this list may be obtained from the Secretary of the

British Association of Trade & Technical Journals, Ltd.,

Sicilian House, Southampton Row. **London, W.C. 1** **Telephone No.: Holborn 395**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d. per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

WANTED, 20 second-hand sextants, good condition. Reply, giving full particulars and maker's name. Optical & Nautical Supplies, 69, Fenchurch Street, London, E.C.

INSTRUMENT WORK Wanted. Experimental or repetition. F. E. Boynton, 391, St. John Street, E.C.1.

THREE Second-hand Trial Cases for sale. Apply, 105, High Holborn, W.C.1.

WANTED to purchase from wholesalers or opticians, new or secondhand trial case, complete mounted lenses. Quote price to Box 3519, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Trial Case. Box 3518, c/o "The Optician," 125, Fleet Street, E.C.4.

TRIAL CASE, as new £10. Bargain, seen London. Box 3517, c/o "The Optician," 125, Fleet Street, E.C.4.

DOLLAND Telescope for sale; 48" focal length, 3" objective. Accessories. May be seen in London. Particulars. Henry Wells, Shrewsbury.

FOR SALE. Half-plate stand camera, mahogany, 10" ext. Beck-Steinheil Unofocal Ser. 1., No. 5. f/6 with Beck Celverex shutter, T.B. to 1/80 sec., 3 mahogany double dark slides, stand, focusing cloth, waterproof case, the whole £3 10s. Also ¼-plate Holborn reflex, magazine 12, Ilex, R.R. f/77. T. and I to 1/100 sec. Leather case, £2. Please address, Box 3508, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

OPTICIAN'S Business for sale in South Coast Seaside Town. Price £500 which includes stock, fittings, fixtures, and fully equipped power workshop. Illness cause of sale. Coton & Hamblin, Woolwich.

GOOD Practical established optical business required, London or suburbs. State full particulars. Box 3513, c/o "The Optician," 125, Fleet Street, E.C.4.

Financial.

INCOME TAX Claims, appeals. Balance Sheets, Accounts. Moderate charges. Write, Penney, 345, City Road, London, E.C.

Employment Bureau. *Concluded from page 8*

SITUATION required by young lady with retail or wholesale optician, 5 years' experience with qualified optician, can do small repairs, neutralising and frame fitting. Good saleswoman. Apply, Box 5805, c/o "The Optician," 125, Fleet Street, E.C.4.

PATENTS.

The owners of Patents No. 14551 of 1914, relating to "Improvements in spectacles, goggles, and the like for producing from artificial light the colour effect of daylight," and No. 20827 of 1914, relating to "Improvements in colour screens for artificially producing daylight," are desirous of negotiating with interested parties for the granting of licences thereunder on reasonable terms.

For information apply to:—Messrs. Lloyd Wise & Co., Chartered Patent Agents, of 10, New Court, Lincoln's Inn, London, W.C.2.

D.B.O.A. and F.S.M.C.

Tuition by post under Expert Tutors. Courses for Diploma Examinations. Short period classes before each examination are given at Manchester. Residence provided.

Apply for particulars to Secretary,

PENNINGTONS, University Tutors, 254, Oxford Road, Manchester

"TAYLOR, TAYLOR & HOBSON, Ltd., of Leicester England, having acquired numerous Patents (British & Foreign) on machinery and appliances for sawing and grinding glass, cutting discs, and mounting, grinding and polishing lenses, are prepared to pay the sum of £50 (fifty pounds) to anyone who may give them satisfactory evidence of any infringement of such Patents."

FOR SALE.

Six Craigleith Optical Grindstones.

Three size 22" diameter x 2½" face and three size 22" diameter x 1½" face complete with Pulleys to run by power fast cutting and good finish put on edge of lens at same time. *For immediate disposal.*

Prices on application to—

JOHN BAIRD, Manufacturing Optician, 68/70, Mitchell St., Glasgow



OPTICAL BLOCKS

To illustrate all features of Optical Service. Write for Lists.

Chemists' Design Service,

12, Humberstone Gate, Leicester.

PERCY S. DE SAULLES.

Manufacturer of . . .

MICROSCOPICAL GLASS SLIDES.

Micro Cover Glasses, Glass Cells and Cavity Slips, etc.

The Platts, Amblecote, Stourbridge.

C. BAKER 244 HIGH HOLBORN LONDON

Sight Testing Apparatus

of all descriptions

SECOND-HAND

Fully Guaranteed.

Estab. 1765 **WRITE TO-DAY FOR SECOND-HAND LIST.**

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
C. O. DYMOND. M.I.Mech.E., F.I.C.P.A.

W. P. THOMPSON & CO.,

12, CHURCH STREET, LIVERPOOL.

Chartered Patent Agents.

H. E. POTTS. M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

T. WHEELER,

Scientific Instrument Manufacturer,

Specialities: POCKET SURVEYING and ABRONAUTICAL ANEROIDS.

217, GOSWELL ROAD, LONDON, E.C. 1

ESTABLISHED 1878 **TELEPHONE CITY 419**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

SELL WATSONS' BRITISH-MADE

MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,

313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1937.

WE ARE

All obliged to consider carefully what we pay for our goods now-a-days, and even a small saving, if often repeated is worth while, provided quality is there.

Quality is our first consideration, and no matter how high the price paid, it is not possible to obtain better quality than W.O.W.

You want proof? Then send a trial Rx order to W.O.W.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY:
DUDDEN HILL LANE, N.W.10

BRITISH OPTICAL INSTITUTE, LTD.,
(College of Optics).

Complete Training for the Sight-Testing Optician.

Supplementary to the usual Daily Classes and Correspondence Courses, a series of Evening Classes is held, for those desirous of preparing themselves for any of the Optical Examinations.

A Course of Weekly Evening Lectures, and Demonstrations, for candidates for the F.B.O.A. Examination, and for post-graduates, has also been arranged.

Clinical Classes.

are held on two afternoons a week, and give Students the special advantage of meeting actual cases, generally of particular interest.

The whole work of the Institute is carried out under the supervision of the Principal, assisted by Mr. Geo. Colebrook, F.B.O.A., F.S.M.C., (Master's Prizeman).

For full particulars apply to:—The Principal, Dr. MAX COGUE, B.Sc., Fern Lodge, 20a, Grove Road, Brixton, S.W.9
Telephone: Brixton 677.

Elliott Optical Co.,

104 & 105 GT. SAFFRON HILL,

LONDON, E.C.1

TRADE EC MARK.

There is no Better House for

Rx Work.

RXS. RETURNED PROMPTLY, ACCURATELY DISPENSED and at REASONABLE PRICES.

Complete Outfit of Rx Stationery supplied, Free of Charge,

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,
DANDURAND BLDG., MONTREAL.
Cable "Optical" A.B.C. Code 5th. Edition.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

***A*.—Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

QUALIFIED Assistant, 21, seeks re-engagement, 2 years' sight-testing experience. Thorough knowledge of optical workshop. F.S.M.C., 59, Eden Street, Kingston-on-Thames.

WANTED, capable man, good refractionist, with workshop experience, able to undertake setting, edging, mounting, etc. all repairs. North of England. Permanent post. Apply, Box 5821, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN, 20, desires position with good-class firm of opticians, 2 years' experience. Passed Prelim. S.M.C. Knowledge of sight-testing. Reply, Box 5820, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT Wanted. Good refractionist, permanent post. North of England. Full particulars, experience, salary required. Photo. Box 5823, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN, 27, requires situation in retail optical business as learner. No previous experience. Can do book-keeping, etc. Box 5819, c/o "The Optician," 125, Fleet Street, E.C.4.

MANAGER experienced, excellent salesman, subjective and objective methods, requires situation, excellent refs. O. E. Smith, c/o Benn Franks, 98, Linthorpe Road, Middlesbrough.

YOUNG LADY, age 17, seeks re-engagement in optical wholesale firm, experience in looking-out and despatching orders, 2 years' reference. Box 5806, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST seeks position where he could gain experience in edging, drilling, etc. Careful and conscientious worker. Box 5807, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED refractionist and salesman (27) requires position as manager or first assistant. Knowledge of photography. Last position 10 years. Apply, Box 5808, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN requires situation in retail opticians. Four years' experience factory and sight-testing. London or district preferred. Box 5809, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. with good all-round experience requires position as manager or first assistant. Please state salary offered in first letter. Box 5812, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACE Worker desires situation. 16 years in London. Experience in wholesale and retail. Well up in all glass work. Good knowledge of glazing and drilling. Able to take charge. Box 5813, c/o "The Optician," 125, Fleet Street, E.C.4.

SMART Salesman and expert fitter with knowledge of sight-testing required for London. State age, experience and salary to Box 5797, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED. Charnley & Sons, require first-class rimless edger, fitter and repairer in their workshop. Apply, 507, Lord Street, Southport, Lancs.

ASSISTANT, 18, requires situation, good knowledge of optical repairs and photography. Home or abroad. Box 5804, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A., 22, wants permanent situation with good class firm. Five years' experience as refractionist. Box 5818, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED for workshop, good all-round hand, repairs. North of England. State wages required. Box 5822, c/o "The Optician," 125, Fleet Street, E.C.4.

TORTOISESHELL Worker required by wholesale London house, must be good frame maker and jobber. Box 5817, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED Situation as first-class all-round gold worker and jobber. Address, E.A. 11, Spencer Road, New Southgate, N.

EXPERIENCED Refractionist and keen business man desires post as branch manager or first assistant. Age 30, tall, passed part B.O.A. Apply, "Optics," 24, High Street, Hastings.

WORKING JEWELLER, age 30, studying optics, would like situation with optician, in Manchester or district. Well up in repairs. Apply, A. Gough, 26, Scarisbrick Road, Levenshulme, Manchester.

YOUNG MAN, age 25, requires situation in wholesale warehouse or stockrooms. 4½ years' experience. Box 5814, c/o "The Optician," 125, Fleet Street, E.C.4.

CAPABLE MAN, with good experience in wholesale and jobbing. Understands all about prescription work, both warehouse and workshop. Has also wide experience in retail as refractionist and handling of scientific instruments and general optical goods. Would take management or consider partnership in good firm. Highest references. Box 5815, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION of trust wanted by capable organiser with good all-round experience in wholesale and retail trade. Accustomed to management. Expert prescription hand and stock buyer, also capable refractionist and salesman. Wholesale or retail. Box 5816, c/o "The Optician," 125, Fleet Street, E.C.4.

PRESCRIPTION Room assistants wanted. Must be fully experienced in neutralising, lens-setting, etc. Apply, General Optical Co., 32, Ely Place, Holborn, E.C.1.

REPRESENTATIVE Wanted. Must be thoroughly conversant with optical trade. Splendid opportunity for smart man. Apply, by letter, giving previous experience, etc., to General Optical Co., 32 Ely Place, Holborn, E.C.1.

YOUNG LADY, F.S.M.C., desires position as optician's assistant. London wholesale. Provincial retail experience. Keen and willing. Excellent references. Box 5824, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST wanted temporarily from February 1st next. Write Box 5825, c/o "The Optician," 125, Fleet Street, E.C.4.

GENTLEMAN'S Youth just left school wishes an apprenticeship to learn sight-testing in a first-class establishment, to live in. Provincial town. 207, High Street, Stoke Newington, N.16.

YOUNG LADY requires situation, clerk or receptionist, Liverpool district, 5 years' experience with leading firm. Clarke, 44, Northbrook Street, Liverpool.

RIMLESS Edger and fitter accustomed to best class work required immediately. Apply, giving age, particulars of experience and salary required to Mr. Reid, 3, Queen Street, Exeter.

YOUNG Man, 18, seeks situation as stockroom assistant. No experience. Box 5800, c/o "The Optician," 125, Fleet Street, E.C.4.

MECHANIC used to meteorological and general instrument work, hand-turning bench, finishing and lacquering. 18 years' experience, any distance, town or country. F. Orford, 83, Ashmore Road, Paddington, W.9.

LADY desires post as clerk, 5 years' general office experience,. quick at figures, typing. Good references. Box 5778, c/o "The Optician," 125, Fleet Street, E.C.4.

Concluded on page 6.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

R. ARCHER & SONS LTD EST 1859



Manufacturing Opticians,

WHOLESALE AND EXPORT.

1, AMWELL STREET,

CLERKENWELL, LONDON, E.C.1

The Prices of Prescription Work.

IT IS CURIOUS how frequently the prices of prescription lenses are canvassed and how seldom the quality, one would imagine that a toric—for instance—"by the river's brim," a simple toric "was to him, and it was nothing more." YET NOTHING IS SO IMPORTANT in connection with prescription lenses as their perfectness, and the amount of faulty work that is met with to-day is considerable. We make no such ridiculous pretension as that of being the only people who can do the thing properly, but we confidently claim to work and to fit prescription lenses of unusually high quality and accuracy. It must be partly for this reason that the volume of prescription orders has been increased so considerably with us—especially during the past two years—and we respectfully commend these facts as worthy of consideration.

TRUST ARCHERS.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

AMERICAN·OPTICAL·COMPANY.LIMITED

WELLSWORTH BRITISH STYLES OF

Goldfilled

Eyeglass Mountings.



1793-1.
Light weight flexible guard.

These Mountings are excellent examples of Wellsworth workmanship. Made up in the most popular styles and of a finish that is unexcelled.

This material is a known quality, as is true of all Optical goods bearing the A.O.Co. Trade Mark, and true to assay.

We have a stock of all popular sizes and your wholesaler can give you prompt service on your Rx work.



1793-2.
Light weight rocking guard

WELLSWORTH

TRADE (A) MAR . Reg.

OPTICAL PRODUCTS.

Quotations from Hatton Garden, E.C. London

Published by The Hatton Publishing, Editorial and Advertisement Offices, 125, Fleet Street, London, E.C.4. Printed by The Century Press, London.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT-MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1608 FRIDAY, JAN. 20, 1922.

ROSS BINOCULARS.



British Government Tests have proved these to be the finest Binoculars in the world.

Send for our new catalogues and terms.

ROSS Ltd., Clapham Common, LONDON, S.W. 4

ELLIOTT'S Rx SERVICE

leaves nothing to be desired.

ACCURACY—PROMPTNESS and REASONABLE PRICES.

104/5, GT. SAFFRON HILL, E.C.1



ARTIFICIAL EYES.

HIGHEST QUALITY.

LOWEST PRICE. WIDEST VARIETY.

R. ARCHER & SONS, Ltd.,
1, Amwell Street, London, E.C.1

Reg'd at the G.P.O. as a newspaper **PRICE 4d** *Subscription post free 12 months 17s*
Postage in United Kingdom 1d

Digitized by Google THE OHIO STATE UNIVERSITY



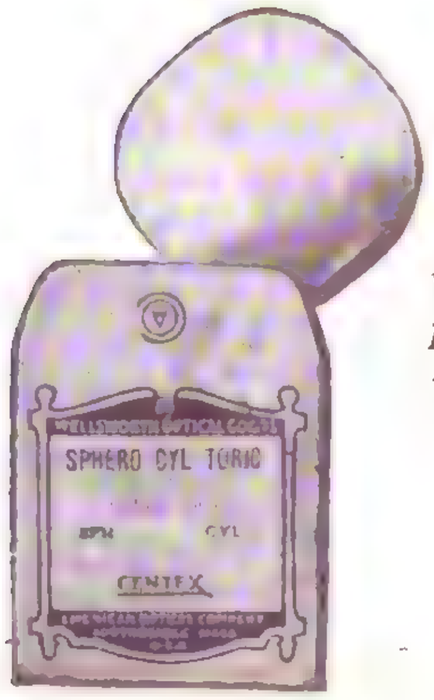
Your Shop Man Appreciates Quality and Service

That is why every up-to-date prescription shop insists upon having

WELLSWORTH TORIC LENSES

because when they are edged and mounted their surface finish is superior to that of any other toric lenses.

You can depend on Wellsworth finished torics because each one is carefully centered and inspected.



Wellsworth Finished Toric Lens

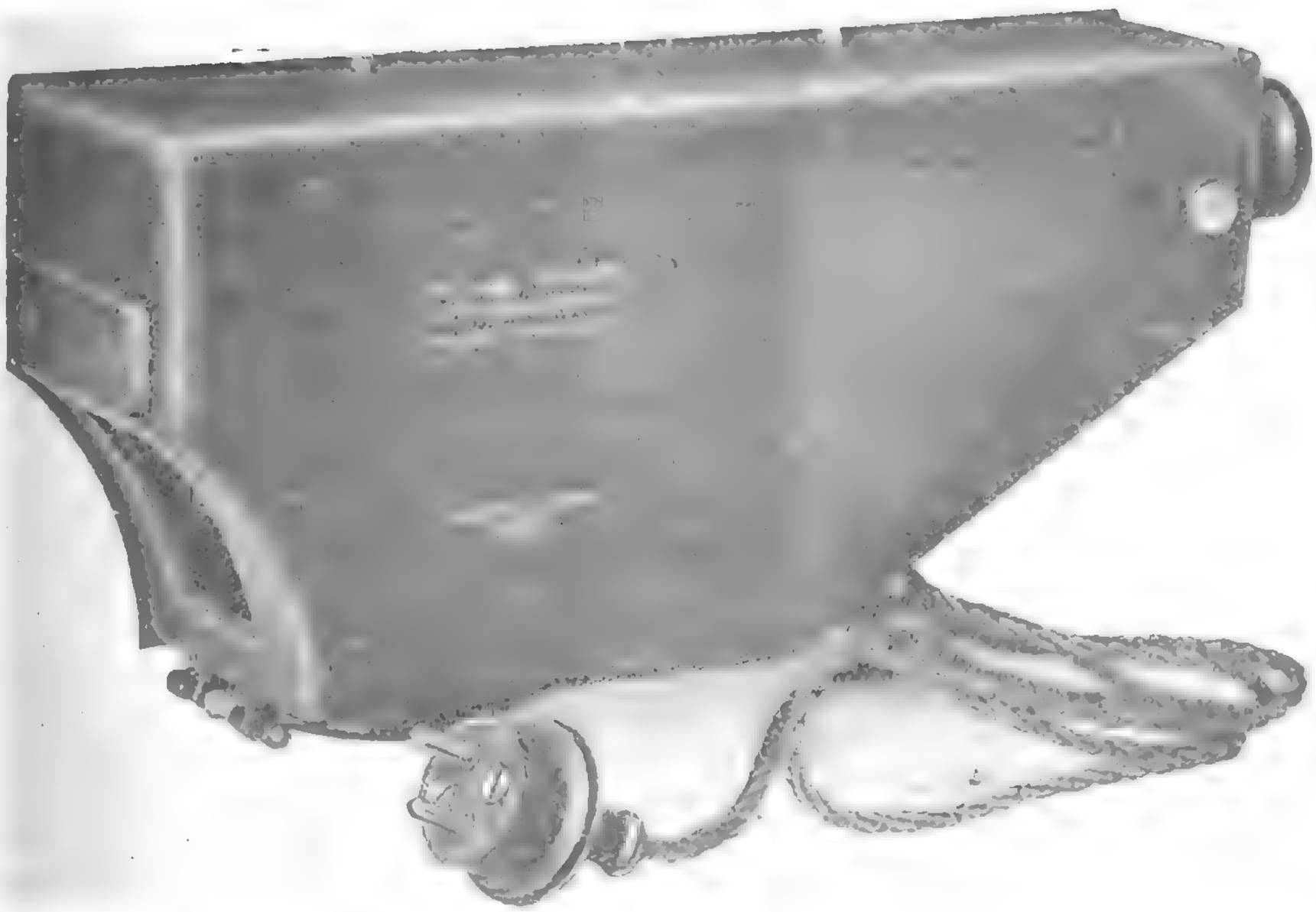
AMERICAN OPTICAL COMPANY, Ltd.,

39, HATTON GARDEN, E.C.1

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE

PATENT L. W. ORTHOPS 167902.



THE L-W ORTHOPS OPHTHALMOSCOPE

This new instrument is entirely reflecting and eliminates most of the difficulties of ordinary ophthalmoscopy; with the minimum of practice, an excellent view of the fundus is obtained.

The instrument is worked by an ordinary small dry cell battery, measuring $3\frac{1}{4}'' \times 3''$.

It is an instrument that should be possessed by every sight testing optician who wishes to make ophthalmoscope examinations.

It can be obtained from any Wholesale Optical House, from whom a fully descriptive pamphlet can be had on application.

Manufactured by **GEORGE CULVER, Ltd., London, N.1**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

J&R F LTD

Price Alterations.

Our latest Price Lists of the following are ready and may be had on application:—

Wellsworth Windsor Spectacles,

also

CASES,

CHAINS,

LORGNETTES, etc.

All the above are revised in accordance with our usual policy of supplying the best goods at moderate prices.

J. & R. FLEMING LTD.,

Telephone:
HOLBORN {814 / 815}
HOLBORN {2788 / 2789} Prescription Dept.

136-148 Clerkenwell Road,
LONDON, E.C. 1.

Telegrams:
"OTTICO." LONDON.

Branches with Prescription equipment:

WALTER BRAHAM & Co. Ltd.
8, Key Hill Drive,
BIRMINGHAM.
Phone: Central 2509
Telegrams: "Brahma."

37, [WESTGATE STREET,
CARDIFF.]
Phone: Cardiff 44
Telegrams: "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1085.
Telegrams: "Ottico."

8, SHUDEHILL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

J&R F LTD

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
The Rt. Hon. VISCOUNT HILL, L.C.C.

Upper Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Renter Warden
HARRY HYLTON-FOSTER. Esq., Past Master.

Director of Examinations
The Rt. Hon. SIR WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in May, 1922.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT·MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,608

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. CITY 5618.

LONDON, FRIDAY, JAN. 20, 1922.

The Panel Question.—Further correspondence published this week advances the question of panel practice in ophthalmic optics a step further towards that full publicity which is most necessary, in connection with a matter as important as any that has arisen in the ophthalmic trade for years past. The main point to be kept in view is that the national insurance business, as affecting supply of spectacles among other things, may be considerably developed; therefore it must not be neglected by any section of the industry because it is now only a small affair, limited to one class of wage-earners. With regard to scales of payment, it does not seem likely that insured persons would grudge or take exception to the fair and even liberal remuneration of professional men, called in to attend to their defects of sight. Insured persons are not heard to complain of the large incomes made by medical men who are "on the panel," but only resent being dealt with cavalierly as paupers, and often it is to be feared very hastily and inadequately treated. We hope now, that the publicity given this new aspect of the panel question relating to optics, in our columns, will be continued; and that it will lead to

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

agreements being worked out that are fair to the parties concerned, and not unsatisfactory to the optical trade as a whole.

* * *

Scientific Handbooks.—A reply is published in our correspondence columns this week to an enquiry from a Baluchistan reader seeking information about handbooks dealing with the theory, use, construction and repair of the various scientific instruments. Also in relation to that enquiry we have received from Messrs. Kegan Paul, Trench, Trubner & Co., two books dealing with "Telephotography" and "Enginering Meters and Instruments." The first is from the pen of a master of the subject discussed, the late Lieut. Cyril F. Lan-Davis, formerly secretary and a director of Messrs. J. H. Dallmeyer, Ltd. The second, dedicated to Sir Richard Glazebrook, is by Mr. Edgar A. Griffiths, of Teddington. It is, so far as we know, unique in the field covered, and gives just the information about commercial scientific instruments that should be had by opticians qualified as the members of a scientific profession. Both of these books will be reviewed at more length later. Messrs. Macmillan & Co., also write us drawing attention to a catalogue of British scientific and technical books issued by the British Science Guild.

* * *

To another question raised in the correspondence columns this week, as to real and imitation tortoise-shell work, we can only reply from present knowledge, that a German book of 300 pages was published in 1909 at Leipzig, discussing the commercial imitations of tortoise-shell, ivory, pearl, mother-of-pearl, coral, amber, horn, whalebone, alabaster, marble, meerschaum, slate, wood, etc. If any reader knows of an English handbook on tortoise-shell working, we will be pleased to publish the name for the information of others.

The Standard of Rejection for Colour-Blindness for Seamen.

Report to the Assistant Secretary of the Mercantile Marine Department, Board of Trade, by F. W. Edridge-Green, C.B.E., M.D., F.R.C.S., (Special Examiner and Adviser to the Board of Trade on Colour-Vision and Eyesight).

There is no universally recognised standard of rejection for colour-blindness since the wool test has become obsolete. With the wool test anyone found to show any evidence of colour-blindness was rejected. The wool test allows 50 per cent. of dangerously colour-blind to pass and of those rejected 50 per cent. are not dangerously colour-blind.

The Nautical Advisers of the Board of Trade are agreed that anyone who can distinguish between the red, green and white lights at a distance of a mile has sufficiently good colour perception for the purpose of navigation at sea.

The point, therefore, for consideration is the degree of defective colour perception corresponding to a failure to distinguish between the red, green and white lights used at sea at a distance of a mile.

About 25 per cent. of men have diminished colour perception in comparison with the remaining 75 per cent. As these cases form a complete series from total colour-blindness to super-normal colour perception the consideration is where the dividing line should be drawn and whether there is some special fact which will indicate the limit of safety. About 5 per cent. of men will fail to distinguish between the red, green and white lights of a properly constructed lantern or with the actual lights themselves at a distance of a mile. These men will equally fail with other properly constructed tests as for instance, my spectrometer or card test. An examination with the spectrometer shows that they may be ranged in three definite classes, the dichromic, who see only two colours in the spectrum, red and violet with a neutral division between them, the trichromic who see only three colours in the spectrum, red, green and violet and who designate the yellow of the spectrum as red-green and those who have shortening of the red end of the spectrum. The spectrometer is the most convincing test in these cases, for instance, the trichromic will isolate a considerable portion of the yellow region of the spectrum containing to the normal sighted orange-yellow, yellow and yellow-green and will state that it is one uniform band of colour.

A person of very acute colour-vision can distinguish seven colours in the solar spectrum, red, orange, yellow, green, blue, indigo. and violet. Those who have for all practical purposes normal colour-vision, six, five, or four colours, those who see six failing to distinguish indigo, those who see five, orange as well, and those who see four, blue in addition. Those who can distinguish seven colours are called heptochromic and those of less acute perception, in descending order, hexa-, penta-, tetra-, tri-, and dichromic. The tetrachromic; or those who see four colours in the spectrum, red, yellow, green and violet, though in continual difficulty about blue and green, have a

Digitized by Google Original from THE OHIO STATE UNIVERSITY

definite yellow sensation and repeated and extended examinations with actual lights extending in some cases over five hours have convinced me that for practical purposes the tetrachromic are not dangerous. The possession of a definite yellow sensation is therefore the deciding point for passing as practically normal.

The lantern is therefore an efficient test and cases of acquired colour-blindness, as for instance those with central colour scotoma, are also excluded as well as those due to defective light perception such as shortening of the red end of the spectrum.

It will be noticed that this standard is based only on facts.

According to my experiments this standard is safe for a greater distance than a mile and will tend to diminish and not increase the number of candidates rejected.

Some Points in Handling Cases of Presbyopia and Subnormal Accommodation.

Lecture given before the Scottish Society of Ophthalmic Opticians by Dr. CHARLES SHEARD, Ph.D., Sc.D., Division of Ocular Interests of the American Optical Company, Southbridge, Mass., U.S.A.

Some years ago Cross wrote with reference to handling cases of presbyopia, the following:—"Presbyopia is the one, so-called, 'easy' ocular condition that is often the most difficult of satisfactory correction, for the reason that occupation, illumination, habit, pupillary distance, and innervation, or bodily vigour, are all factors to be reckoned with. Then, if combined with this, the ignorance and stupidity of many patients in answering questions is taken into consideration, it is easy to see why changes in reading glasses are so frequent." And Gould, some twenty ago, wrote:—"When I began practice I did as I had been taught regarding the correction of presbyopia. Text-books, teachers and general custom agreed that presbyopia began some time after forty. There was a rough rule wandering about that plus spherical lenses of one diopter were needed in forty-five-year-old-oatients, twos at fifty, threes at sixty. This was about the time of the 'Punch, brother, Punch with care, a blue slip ticket for a five-cent fare, etc.' Actual dealing with presbyopic patients soon brought me up sharp. Rules like those of the street-car conductors would not work out in the oculists' office. If any rules at all were admissible they had to be of a different kind from those of the text-books; in some ways far more definite, in others more indefinite."

I think we will all agree with Cross and Gould in their main point of contention in cases of presbyopia, and that is this: that they are often among the difficult rather than the easy ocular cases from the standpoint of giving satisfaction and comfort, as well as relieving what we may term "nerve-drain" in hundreds of cases of early presbyopia or the younger person of premature presbyopic condition. And I believe also that we ought to bear in mind the facts which Cross briefly recited, for habit is the destroyer of our resiliency and adaptability, and years are the destroyers of our physical and nervous constitutions, for we all of us begin to die at the moment we are born. The older we grow the more susceptible we are to annoyance and to fatigue, and that which we could do with ease in our twenties we do either not at all or else with rather rapid exhaustion as we proceed into middle life.

In the first place, then, let it be stated that we believe the static refraction, upon which the presbyopic correction should be based, must be carried out with care. When there is youth and a large range of accommodation, the refractive error may not produce the injury or ill-effects which occur in the presbyope. This is self-evident you say; and yet many fail to appreciate its significance. And I feel that it is rather more appreciated in America than in Europe. Possibly mathematical percentages mean little or nothing in ocular errors: we know that a low degree of astigmatism may produce reflex symptoms and not interfere with vision whereas a large amount may have no accompanying reflex symptoms and yet markedly affect visual acuity. Still percentages are of significance when used in showing the likelihood of an error or anomaly of refraction, such as hyperopia, being born by the function of accommodation. For an error of half or three-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

quarters of a diopter of hyperopia in a young person of twenty, with an amplitude of accommodation of eight or nine diopters and leading an average existence, is commonly born without discomfort since the reserve accommodation is large. If this same error existed in a person whose amplitude of accommodation was three diopters, we are likely to have noticeable results including much dissatisfaction and discomfort on the part of the subject for the reason that such a continuous drain upon the low accommodative resources cannot be born without untoward symptoms.

Nature's Rebellion.

Of course, nature may pursue one of two courses; either the strain upon the accommodative resources may be too great and the resultant fatigue too marked, such that the accommodative mechanism fails to correct the error with the result that the possessor does not see *clearly* and *distinctly* or, on the other hand, the desire for keenness of vision may be satisfied but at the expense of the function involved and with *subsequent reflexes* and other evidences of nature's rebellion. We so often encounter those who are suspiciously presbyopic—especially in the early stage—who either feel that their vision is failing, since they complain of the fact that they cannot see as well as they once did, or else complain of nagging sensations about the eyes. Of course, all reflex symptoms are in the early presbyope aggravated from close-work, but we have many cases in which cessation from close work and an out-of-door life do not remove the strain upon the accommodative muscles and centres, and again we have many who wear their glasses for reading purposes who do not get satisfactory eye comfort. There is much, therefore, to be said in emphasis of this first point in the case of presbyopia and those having subnormal accommodation, to wit; a careful determination of the static refraction.

Carelessness in placing the axis of a correcting cylinder, the failure to get the accurate amount of the refractive error, failure to determine the small anisometropia which so frequently exists in those who have come to the presbyopic stage without ever having been inconvenienced with glasses, nearly always are more disastrous in the class of cases we are discussing than in eyes with plasticity, and with activity of neutralising powers, and which very gratefully receive assistance approximating the proper amount.

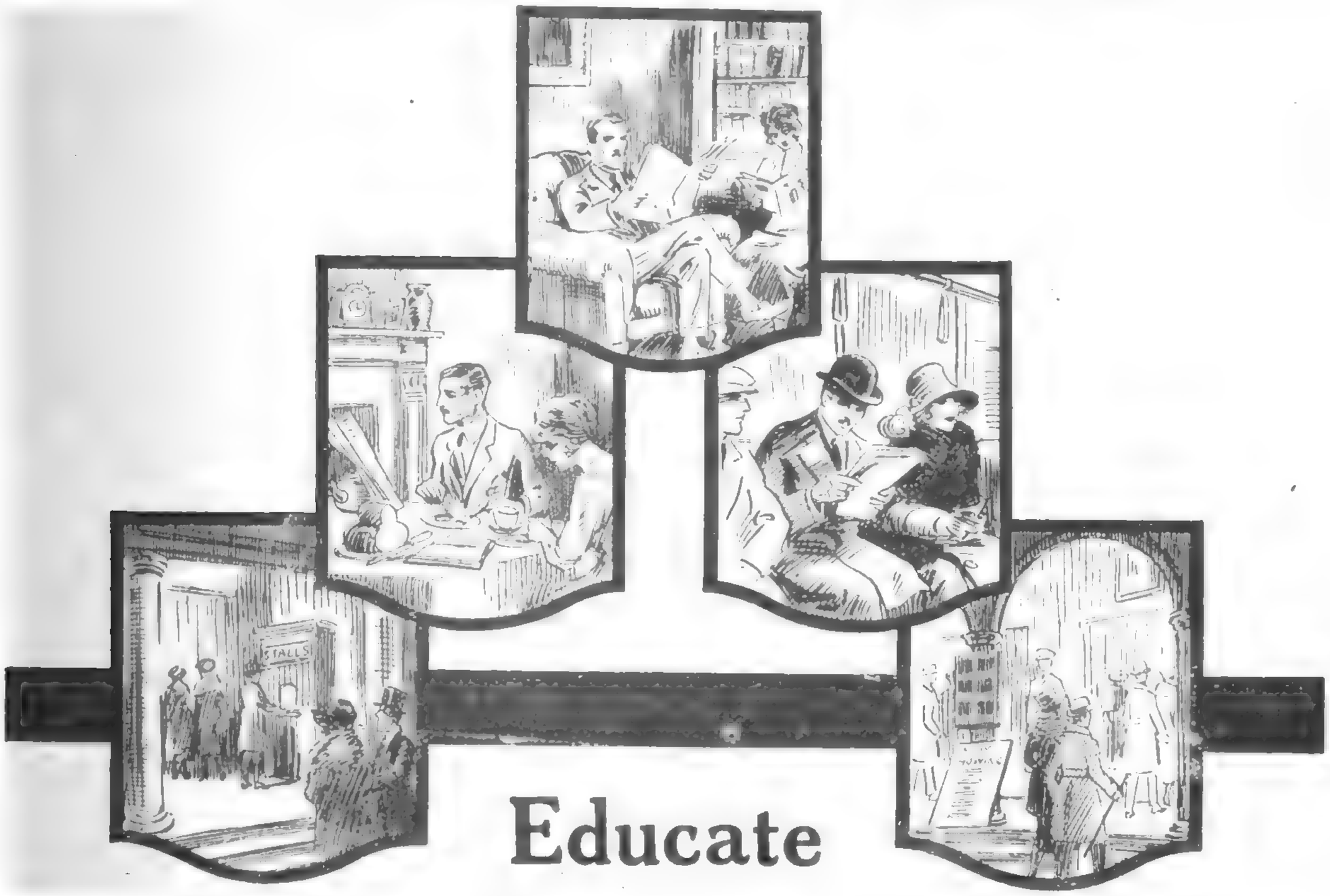
In the second place, age has nothing to do *per se* with *presbyopia* and the necessity for giving presbyopic corrections. Or we may state our premise in another form; presbyopia is a misnomer, since age has nothing to do in and of itself with the condition of a pair of eyes as to their acuity conditions or their amplitudes of accommodation. Presbyopia in fact, exists whenever, after the static refraction has been determined and the eyes equipped with proper corrections, the eyes are unable to maintain the act of reading with distinctness, ease and comfort at the point desired. Presbyopia, therefore, is a condition in which the demands upon the accommodation at the customary near-point of working, reading or other close-work, are excessive and cannot be continuously supplied through the normal act of accommodation, resulting in the ability to see details distinctly, or if seen distinctly, with discomfort and reflexes. To be sure, this depleted amplitude of accommodation may be due to hardening of the lens substance, to weakness of ciliary muscles *per se*, or again to impairment of innervational centres or obstruction to the delivery of nervous impulses from the appropriate nuclear centres.

Since presbyopia is a misnomer and since that which should be classed as presbyopia—either normal or premature, natural and in the course of events, or pathological—is best defined as a condition of depleted amplitude of accommodation such that, with far-point placed at infinity, close work cannot be pursued with comfort and ease, we feel that it will be a good thing if the term were to be regulated to the pages of history and reference made solely to *accommodative resources* and *demands*.

Dependence on Pre-existing Error.

In the third place, however, the age at which we may ordinarily expect to prescribe presbyopic correction does depend somewhat upon the pre-existing error. The old rules, you will remember, gave forty-five as about the earliest presbyopic age to be normally expected. But all such rules are obviously absurd. For one thing, the static refraction will be an important factor; that is, the presence or absence of hyperopia, emmetropia or myopia as a static refractive condition will obviously play a part in determining the time at which an average pair of eyes will be forced to seek assistance in doing close work. Evidently this point with reference to presbyopia is again one of accommodative demands and accommodative resources. To be sure, a static uncorrected hyperopia will call for what is commonly called presbyopic corrections earlier than a condition of emme-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



Educate

Nothing new for the good of people ever sprang into fame in a night.

It takes time for new ideas to win their proper proportion of popularity.

But don't let time bear all the burden of making **Chance's 'Crookes' Glass** thoroughly known in your locality. Use publicity.

We will supply you free with excellent advertising matter for use in your local press and places of entertainment and in your windows, if you will kindly communicate with us.

CHANCE BROS., & Co., Ltd.,

Glass Works,

SMETHWICK, BIRMINGHAM.



The late Sir Wm. Crookes, O.M., F.R.S., to whose researches was largely due ***he evolution of Chance's Crookes" Glass.***

Chance's 'CROOKES Glass

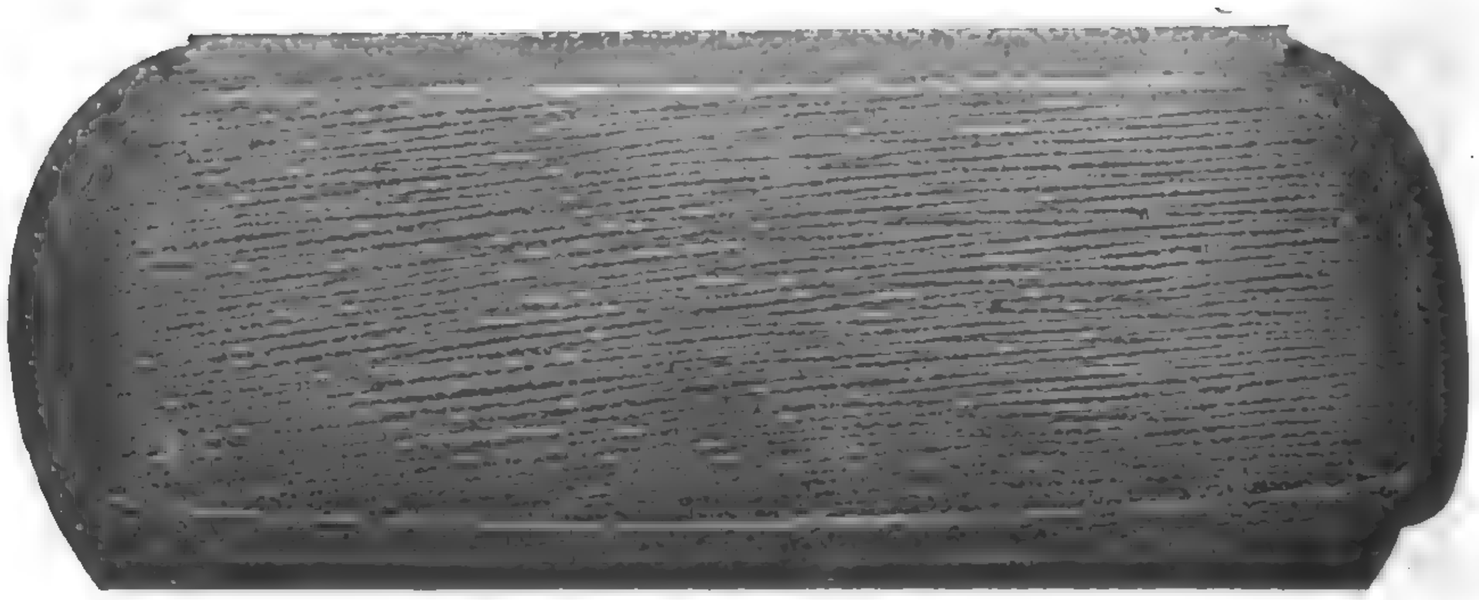
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"WERTEX"

WILLMOTTS'

LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.



11c 11c

First impressions are important, consequently your Testing Room is made attractive.

Lasting impressions are even more important, so complete a transaction by giving an attractive and lasting case.

Use "WERTEX" Cases.

Details and samples from your dealer or direct from the manufacturers.

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

ENGLAND.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

tropia and earlier again than in myopia, all other things being equal. Astigmatism creates greater indefiniteness, especially if unequal or non-symmetrical in the two eyes.

Correction of Static Ametropia.

And again we may ask whether or not the correction of the static ametropia has any influence on deferring the necessity of a presbyopic correction. It certainly does, for the correction of hyperopia prevents over-development and hypertrophy of ciliary muscles and makes a pair of eyes function approximately as though emmetropic. Exercising the ciliary will also, so Savage claims, defer the day of depleted resources for close work. Possibly the myope is the only one who, without his distance glasses, may be able to proceed without a reading correction, but his state is as bad as that of the hyperope who enjoys distance vision but cannot get along without a reading correction. We have every reason to believe that proper functioning of any organ will contribute to its longevity and to its ability to do its work without assistance; we have every reason to believe that the early correction of hyperopia and astigmatism and the constant wearing of such corrections will aid in deferring the day of accommodative assistance in close work.

The onset of presbyopia demanding correction may be delayed without doubt beyond the normal age by hypertrophied accommodation. This abnormalism of excessive accommodation is, of course, due to the over-functioning of the ciliary muscle and possible abnormally retained elasticity of lens. But excessive use of any organ or abnormally prolonged use always produces a disastrous reaction. The excessive use of accommodation in presbyopia causes eyestrain and all of its reflexes. The eye itself and the nervous system must suffer. I think we need to teach our people that these boasts as to ability to read at fifty without glasses and the accounts of old people reading without a pair of spectacles are simply boasts; that in the end one of two things happens in general; reading and other close work is given up or the day comes when the eyes rebel and refuse to do such work and "all the King's horses and all the King's men cannot set them together again."

Ah, yes, indeed! You must have had them; eyes that had little or no static error, that were keen at distance seeing and that belonged to a proud possessor—falsely proud—who needed accommodative assistance in close work and yet put off the day of salvation. And have you not seen some of these back, veritable wrecks, with eyes hypersensitive, literally beaten to death—and it has taken hours of your time and weeks of your patience and sympathy to help nature repair the damage which could have been so easily prevented. Indeed, a condition of presbyopia to one who has been blest with a splendid seeing, well functioning power of eyes, may well-nigh be his ruination, and it takes skill and science on the part of the practitioner to induce such a person to do that which is right by himself or herself.

Fourthly, the amplitude of accommodation, the accommodative reserve and the amount of correction possibly needed in the best interests of the ocular functions are matters of test and not of age or of rule. Every pair of eyes is a law unto itself. True it is that we have a series of tables due to Donders, Landolt, Risley, Duane, Jackson and others which give us their findings as to the age-accommodative amplitudes and far and near points. In the main these agree, when the various methods of obtaining data are taken into account. Some of these methods involve nearest point of ability to read distinctly, others to just decipher or count dots, still others involve the use of concave lenses. But they are, like acuity charts such as that of Snellen, simply *averages* and give a *standard* or something by which we may judge as to whether the pair of eyes we have under test is below, equal to, or apparently superior to the average eyes from the *accommodative* standpoint.

Only Average Conditions.

To my mind Donders never intended anyone to believe that every person who, for instance, was fifty years of age, should be presbyopic an amount such as he specified, but rather did he, we believe, desire to present such a table, carefully prepared from the best data available, to show the *average* condition and thereby enable us to judge of the significance of our particular set of data obtained in the light of the table of averages. Neither do I believe that such a table should be used in conjunction with the finding of the near-point as is involved in the following procedure:—

Take the nearest point monocularly at which details can be distinguished; convert this into the dioptric equivalent; take the difference between this finding and the amplitude of accommodation given by Donders, for instance, for emmetropia at the age of the person under test; this difference will then be the distance correction. Presumably inter-relationships between accommodation and convergence are

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

eliminated, since monocular tests are made, but the method as a whole is of no particular value. The first part is, however, for it gives us the amplitude of accommodation actually existent, without taking into account the ametropia. But the use of Donders' table and the taking of the difference of the two readings specified to represent the ametropia is obviously using such a table as an infallible standard and not as an average which may be reasonably expected. Donders' and other tables of amplitude of accommodation, far-and-near-points and so-called presbyopic corrections are, to my mind, exactly analogous to life insurance tables which show the average expectancy of life at the age specified; there is no guarantee or assurance of such existence.

Anisometropia and Amblyopia.

Fifthly, the presence of a considerable amount of anisometropia as well as the presence of amblyopia exanopsia in one eye may considerably modify the presbyopic correction to be given. We have had in our own practice many cases in which the difference of refraction in the two eyes is so marked that evidently the major portion, if not the whole of distinct seeing, both at distance and near, has been accomplished by one eye. If such conditions are found in early years and corrected, quite generally the accommodative functions in the two eyes will be found to work together in unison. In such cases little difficulty will arise except possibly in the matter of the ability to give equality in ability to read, which conditions may be impossible especially when one eye is wearing a high astigmatic correction. But in cases in which the ametropia is marked and in which the vision has been very keen in one eye, so much so that often the possessor fails to be appreciative of his low vision in the other eye, trouble often arises in presbyopic corrections in which any attempts are made to give the presbyopic corrections in addition to the full or nearly full static refractive corrections.

The reason for this is fairly obvious; for the retinal images are so dissimilar and habit so strong that it is almost impossible to give scientific prescriptions without causing extreme annoyance to the person examined. Pages are lop-sided, and the highly anisometropic or amblyopic eye, not being accustomed to the act of binocular vision and being unaccustomed to its continual use in vision, rebels and things are worse than in their former state. We remember very clearly the case of a woman of about 60 years, who said she had possessed no use of one eye since a child. After the correction of the high error we found it possible to give V=20/20, and after giving proper additions for reading to both eyes left this woman happy in the use of her two eyes. But the outcome was that which we feared, for she was unable to use her glasses for any but brief periods of time and we had to resort to methods of slowly restoring the amblyopic eye to normal functionings.

The exclusion of one eye from functioning always brings most difficult problems. But, by excluding the good eye and giving a partial correction to the amblyopic eye, it is often possible to, in the course of time, slowly restore it to normal vision with comfort through proper correcting glasses, and to then proceed to harness the eyes together in binocular vision and in reading. I am positive that many eyes in the presbyopic stage which are to be classed in the kind of case we are discussing, come to every practitioner and that much more could be done for than is generally attempted.

Unequal Accommodation.

In the sixth place, inequality of accommodation in the two eyes is a matter which should receive greater attention than it does. There is no reason, *per se*, for assuming that the amplitude of accommodation in each eye is the same and that presbyopic reading corrections should be prescribed as O.U. +1.00 or +2.00, etc., any more than there is reason for believing that the static refractive error will be the same in both eyes. To be sure, in general such is the case, but the law of averages and the *general* condition has no business in ocular refraction. The finding of inequalities in accommodative amplitude in presbyopes serves one or the other of two purposes:—

(1) If an inequality of reading correction is found in order to give equal range and reading amplitude, suspicion may be cast upon the inaccuracy of the static findings in one or the other eye. This leads to our emphasising the importance of making comparison tests to see that each eye, fitted with static findings, has equally good or keen visual acuity where such is possible. This is an important test and is too often omitted. Quite often, then, inequality of accommodative amplitude or apparent reading addition is found to be due to inaccurate distance findings and corrections. (2) If a genuine difference of amplitude of accommodation does exist, this immediately shows the necessity of a difference in reading

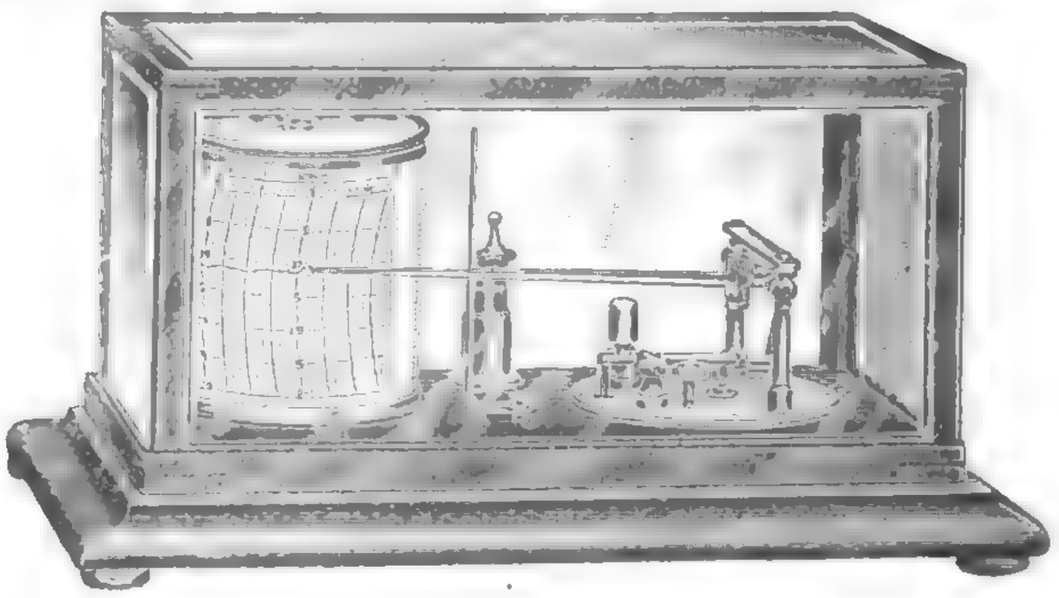
Digitized by Google Original from THE OHIO STATE UNIVERSITY

A POPULAR BAROGRAPH
of S. & M. Quality.

This first-class Recording Barometer combines an unusually high degree of accuracy with very moderate price. The Vacuum movement is concealed beneath the base plate, the whole construction being typically "S. & M." in quality and reliability. Available for prompt delivery, either in oak or mahogany case with glass cover, eight day clock and one year's supply of ink and charts.

The world-wide reputation of "S. & M." Scientific Instruments entails no penalty to the Retailer. Every sale shows a handsome profit.

Write for full particulars, terms and general booklet.



S. & M. No. 2318.

SHORT & MASON, Ltd., Aneroid Works, Walthamstow, London, E.17

MANY SUCCESSES IN THE EXAMINATIONS!
Your Opportunity to
QUALIFY IN OPTICS
PRACTICAL WORK. Students taking the Course may receive personal tuition in the practical work AT ANY TIME DURING THE COURSE.

Expert Tuition by Correspondence for the SIGHT-TESTING DIPLOMAS of the Worshipful Company of Spectacle Makers (F.S.M.C.), or the British Optical Association (D.B.O.A.).

Write for full particulars—
C. A. SCURR, M.P.S., F.S.M.C., F.I.O., etc.
64, High Street - - - - BARNET.

WE ARE

All obliged to consider carefully what we pay for our goods now-a-days, and even a small saving, if often repeated is worth while, provided quality is there.

Quality is our first consideration, and no matter how high the price paid, it is not possible to obtain better quality than W.O.W

You want proof? Then send a trial Rx order to W.O.W.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY,
DUDDEN HILL LANE, N.W.10.

TURNERY WORK
IN
EBONITE
Small turnery work of all kinds undertaken. Rod and Sheet supplied in any quantity, cut to order. Enquiries Solicited.

BURGE, WARREN & RIDGLEY LTD.,
91 & 92, GT. SAFFRON HILL, LONDON, E.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

OPTICAL MANUFACTURERS LTD.,

(Incorporating Wheway Optical Co., Ltd.)

WAR TIME CONTRACTORS TO THE ARMY SPECTACLE DEPOT.

Manufacture for the Wholesale Trade:—

Gold and Gold Filled Spectacle and Astig Frames.

Gold and Gold Filled Rimless Spectacle and Finger Piece Mountings

Gold and Gold Filled Monocles and Reading Glasses.

Solid Nickel Spectacle and Astig Frames.

Solid Nickel Pillar Frames and Folding Gauze Spectacles.

Steel Spectacle Frames.

Spectacle Sides and Jobbing Materials, in all Metals.

Extract from a letter received from Australia:

"We are delighted with the goods just supplied and if you can only keep the prices right and maintain the same quality, you may rely upon getting all our business."

All these Articles are of English Manufacture

Works at VYSE STREET and GEM BUILDINGS, HOCKLEY HILL, BIRMINGHAM.

London Office: 55, HATTON GARDEN, E.C.1.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

additions and furthermore is a cause for making further examination as to any pathological conditions which may be at the seat of the lowered amplitude in the one eye. This inequality of function may, therefore, be due to anisometropia, right-eyedness or left-eyedness, peculiarity of occupation, of heterophoria, of monocular disease or of injury. The manner of procedure depends, of course, upon all the findings.

As a seventh point, it seems to me to be a fallacy to say that presbyopia exists if fine print cannot be read at eight inches. We often find this statement in print, but it is simply another evidence of an arbitrary rule which may or may not be applicable in a given case. In the first place, the distance at which print is read or the close work conducted is more of a criterion of the necessity of a reading correction. The near point with emmetropia for distance or static correction worn may easily be as low as ten inches and yet no reading correction is needed, since many persons do their close work at considerable distance from their eyes, for instance at 18 or 20 inches. If the amplitude is four diopters, and one-half of it only is constantly demanded at close work, and if the periods of application are not too long, we often find comfort and satisfaction without reading corrections. Many other factors than a mere determination of a close-point with an arbitrary standard set as to necessity of presbyopic correction enter into such determinations; as, for example, the character of work, hours of application, general bodily health, condition of nervous system, etc.

Donders laid down a much simpler, more important and elastic law when he wrote: "The accommodation can be maintained for a distance at which, in reference to the negative the positive part of the relative range of the accommodation is tolerably great." With this as a practical clinical basis is seems to us a far saner procedure to find the positive part of the relative range of accommodation at the point of customary reading and close-work. Such positive portion of accommodation is determined through the use of concave lenses, the test object used being held at the usual reading distance.

Reading Distance.

And again, this matter of an arbitrary five inch point of reading fine type leads us into serious trouble for the reason that, due to enlarged retinal images, narrowed pupils and even narrowing of palpebral fissure fine type may possibly be read at eight inches when a genuine presbyopic condition exists and is in need of attention. My own feeling is that, after all, ability to read fine print at a close point is not as accurate a test as we might wish it to be. Chief of these objections is that it gives us, under circumstances which do not introduce other inaccuracies or fallacies, a measure of the maximum ability, as judged by the test, on the part of the accommodation rather than giving us a test upon the nearest point at which accommodation may be exercised and maintained. Furthermore, it appears to me to be an abnormal kind of test, for the reason that accommodation is not normally called into play at any points closer than the customary near-working point.

[To be concluded.]

Messrs. Kirk Bros.—Staff Dance.

The staff of Messrs. Kirk Bros., wholesale and manufacturing opticians, is to hold a dance at the Finsbury Town Hall, Rosebery Avenue, W.C., on Monday, February 6th next, from 7.30 till 11.30 p.m. There are no less than 30 dances on the programme, so the musicians (the "Original Jazz Wizards") are likely to have a busy time; and there is no doubt that the visitors will spend a most enjoyable evening. The organisers of the dance are Messrs. H. & H. Arnold, admission by programme being 2s. inclusive. The M.C. is Mr. Harry Winter.

Mr. G. H. Zeal is notifying his friends in the trade that for family reasons he has formed his business into a private limited liability company, under the style of G. H. Zeal, Ltd., as from the 1st January, 1922. (See note in *The Optician*, December 30th last, p. 292). All debts and liabilities will be discharged by the new company, which will take over all assets of the business hitherto carried on by Mr. Zeal, who will continue his personal supervision of the undertaking.

New Company.

British Spectacle and Eye Glass Insurance Co., Ltd.—Private Company. Capital, £500 in £1 shares. To carry on the business of insurance against accident and damage to or breakage of spectacles, eyeglasses, lenses and similar articles; and as opticians, spectacle makers, etc. The first directors are:—Geo. Joseph, 757, High Road, Leytonstone, and Harry Gordon, 116, Elm Park Mansions, Chelsea, S.W. Qualification: £100. Remuneration: £100 each per annum. Secretary: H. Gordon. Registered Office: 3, Iddesleigh House, Caxton Street, S.W.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Geometrical Ophthalmic Optics.—IX.

By WILLIAM SWAINE, B.Sc.

Spectacles and Near Vision.

The following definitions may be found in most elementary treatises.

1. The true ocular (Laurance), cardinal or principal refraction (R) of the eye is the reciprocal of the distance of the far point from the first principal point of the eye. This far point is the point conjugate with the retina as imaged by the whole refracting system of the the eye, the latter being unaccommodated.

The distance correction is such that an infinitely distant object is imaged at the far point. It immediately follows by effectivity modification (Geom. Ophth. Optics.—III. *The Optician*, June 3rd, 1921. p. 211), that

$$R = \frac{V_{12}}{1 - \delta_2 V_{12}}$$

where V_{12} is the back vertex power (or nominal trial) of the distance correction, and δ_2 is the distance between the back vertex of the spectacle lens and the first principal point of the eye.

2. The principal point near refraction (R_n) similarly is the reciprocal of the distance of a near object from the first principal point of the eye, the latter accommodated on the near object.

During accommodation the crystalline increases in power and therefore causes a slight displacement of the principal point, which may be neglected to a first approximation (see Table of Schematic Eyes. Art. VII. Oct. 28, 1921. p. 135).

If the eye be aided by its distance correction an object whose vergence is A_1 from the front surface of the lens is imaged

$$A_2' = \frac{A_1 + D_1}{1 - \delta_1(A_1 + D_1)} + D_2 \quad \ldots (29)$$ [Art. V. p. 309

It therefore follows that

$$R_n = \frac{A_2'}{1 - \delta_2 A_2'}$$

3. The accommodative effort, or amplitude of accommodation, was defined by Donders $(R_n - R)$. It is the amount of additional power which the eye must assume in order to focus near objects. This may be easily shown.

If D be the power of a static eye,

D_n be the power of an accommodated one,

A′ be the vergence of the retina from the second principal point (assumed constant with the nearly stationary second unit point).

Then $R + D = A' = R_n + D_n$.

or $(R_n - R) = -(D_n - D)$

This change of ocular power, following Donders and using the Helmholtz, Schematic II. eyes, may be referred to a change of power of the crystalline (see Gleichen, Theory of Modern Optical Instruments Eng. Trans., 1st. Edit. p. 113). If $(C_n - C)$ be the change of power of the crystalline by accommodation.

$$(D_n - D) = 0.82\,(C_n - C).$$

Herein lies the advantage of the Donder's definition of amplitude of accommodation.

(Compare Lionel Laurance, Visual Optics, 1920, p. 385).

4. By effectivity modification of the powers in the two meridians of an astigmatic correction the ocular astigmatism may be obtained (see Laurance, p. 298). The writer showed in *The Optician* (June 18, 1920. p. 220) that in the static Helmholtz II. eye the ocular astigmatism is equal to .9 times the corneal. The main seat of the higher astigmatic errors is at the cornea which does not alter with accommodation. On account of the disturbance of relative powers by the accommodating crystalline, the relation between corneal astigmatism and ocular astigmatism is .86. The alteration may be ignored, likewise the difference between the principal points for the two meridians.

If R_1 and R' are the unaccommodated principal refractions the astigmatic eye,

R_{n1} and R_n for the accommodated eye.

$(R_1 - R) = -(D_1 - D) = .89\times$ corneal difference.

$R_{n1} - R_n = -(D_{n1} - D_n) = .86\times$ corneal difference.

$$\text{Then } \frac{R_1 - R}{R_{n1} - R_n} = 1.04$$

and we may without serious error consider that the difference of principal point refractions is constant during accommodation and approximately equal to .88 corneal astigmatism. Astigmatism then may be regarded as a special case of ametropia correction.

It will be evident from the expressions R, A_2' and R_n, that, for a certain object vergence

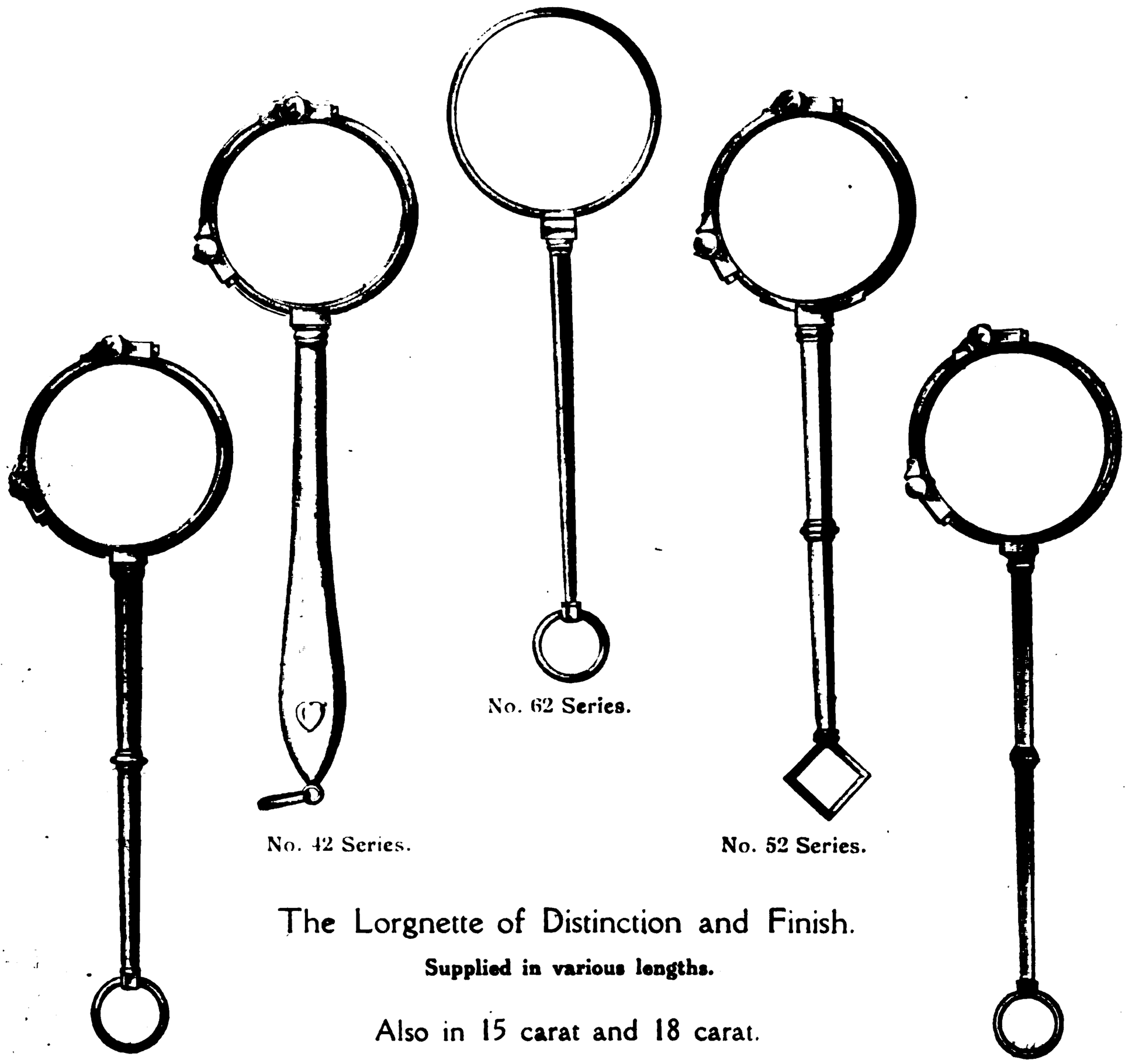
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

W.H.T.

9ct. GOLD LORGNETTES

(OUR OWN MANUFACTURE)



No. 22 Series.

No. 42 Series.

No. 62 Series.

No. 52 Series.

No. 32 Series.

The Lorgnette of Distinction and Finish.

Supplied in various lengths.

Also in 15 carat and 18 carat.

Selections sent on approval.

WALTER H. THOMPSON

66 HATTON GARDEN, LONDON, E.C. 1.

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

IT COMPELS ATTENTION.

The "GENOCO" Electric Flashing Window Sign.

Brings increased business to the Optician..



Size 13" x 11" x 9"

This sign is designed for use inside the Optician's window, and is supplied complete with 4 interchangeable Framed Opal plates.

The plate shown in the illustration is in 2 colours, for when the plate is illuminated from the back, the words, "If so, Consult us" shew up in red lettering inside the question mark.

The other plates are in black and red lettering on opal, and worded as follows:

"Repairs to Spectacles and Eyeglasses quickly executed."

"Oculists' Prescriptions carefully filled."

"The Best is always the cheapest in the end. Crookes lenses are the acme of perfection. Wearing these ensures comfort."

One unique feature of this sign is in the fact that when the plates are not in use on the sign, they can be hung up round the waiting room or shop, to continue their work of impressing their message.

Wired for any voltage. Special plates can be made to order.

Price on Application to

THE GENERAL OPTICAL Co. (E. T. & F. W. Cornwell),

31 & 32, ELY PLACE, HOLBORN, LONDON, E.C. 1

Telephone: 615 HOLBORN. **Telegrams: GENOPTICO, SMITH, LONDON.**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

A_1, the accommodation ($R_n - R$) depends on V_{12}, A'_2 and δ_2 whilst A'_2 depends on V_{12} and D_1, *i.e.*, on the form of the lens (the factor δ_1 is practically constant for all forms of lenses of the same power V_{12}; it cannot be ignored for the deeper higher power positives).

Consider the actions in certain leading cases which may enter even in everyday work.

(1) $V_{12} = +6.0$ (spherical) $A_1 = -4.0$ (reading distance).

(*a*) *Symmetrical (Trial) Lens.* $D_1 = +2.98$; $\delta_1 = 2.0$ mms.

Then $A'_2 = +1.96$.

when $\delta_2 = 15$mms.; $R = +6.59$; $R_n = +2.02$; $R_n - R = -4.57$.

(*b*) when $\delta_2 = 20$ mms.; $R = +6.82$; $R_n = +2.04$; $R_n - R = -4.78$.

(*c*). *D.M. -6.0 base.* $D_1 = +11.71$; $\delta_1 = 1.8$ mms.

$A'_2 = +1.86$.

when $\delta_2 = 15$mms.; $R = +6.59$; $R_n = +1.91$; $R_n - R = -4.68$..

(*d*) when $\delta_2 = 20$ mms; $R = +6.82$; $R_n = +1.93$; $R_n - R = -4.89$.

(2) $V_{12} = -10.0$ (spherical) $A_1 = -4.0$.

(*a*) *Symmetrical.* $D_1 = -5.0$; $\delta_1 = .67$ mms.

$A'_2 = -13.95$.

when $\delta_2 = 15$mms; $R = -8.70$; $R_n = -11.53$; $R_n - R = -2.83$.

(*b*) when $\delta_2 = 20$ mms; $R = -8.33$; $R_n = -10.91$; $R_n - R = -2.58$.

(*c*) *Plano.* $D_1 = 0.0$; $\delta_1 = .67$ mms.

$A'_2 = -13.99$.

when $\delta_2 = 15$ mms.; $R = -8.70$; $R_n = -11\text{-}57$; $R_n - R = -2\text{-}87$.

(*d*) when $\delta_2 = 20$ mms.; $R = -8.33$; $R_n = -10\text{-}94$; $R_n - R = -2.61$.

(3) $V_{12} = -14.0$ (spherical). $A_1 = -4.0$.

(*a*) *Symmetrical.* $D_1 = -7.0$; $\delta_1 = .67$ mms.

$A'_2 = -17.92$.

when $\delta_2 = 15$ mms; $R = -11.51$; $R_n = -14.12$; $R_n - R = -2.55$.

(*b*) when $\delta_2 = 20$ mms.; $R = -10.94$; $R_n = -13.19$; $R_n - R = -2.25$.

(*c*) *Plano.* $D_1 = 0$; $\delta_1 = .67$ mms.

$A'_2 = -17.99$.

when $\delta_2 = 15$ mms.; $R = -11.57$; $R_n = -14.16$; $R_n - R = -2.58$.

(*d*) when $\delta_2 = 20$ mms.; $R = -10.94$; $R_n = -13.23$; $R_n - R = -2.29$.

Now consider specific applications of these lenses.

A. *Man with one eye* (spherical error, symmetrical lens worn).

The corrected hypermetrope must accommodate more and the myope less than would the emmetrope. In this case neither the presbyope nor a young patient would experience any inconvenience. The young patient could easily accommodate the amounts or alter the position of the object to compensate. If the patient be actually presbyopic, or the lens gives a pseudo effect of premature presbyopia, the near test would reveal it, and an additional reading correction would be adapted; the test made by symmetrical lenses would be identical with the symmetrical spectacle prescribed.

B. *Man with two eyes* (spherical symmetrical lenses worn.

If the errors in the two eyes be equal and the positions of the correcting lenses (distance lenses) similar considerations hold but the harmony between accommodation and convergence of the visual axes would be disturbed, a possible cause of asthenopia (assuming the lenses re-centered for near work). Suitable decentration could be made but the conditions do not approximate to emmetropia.

If the corrected eyes be anisometropic, then whilst accommodation is most probably zero for distance, it will differ in the two eyes when viewing a near object. A change of lens in one eye may be necessary, or in both to approximate to emmetropic accommodation.

C. *Astigmatism with one eye.*

Consider an astigmatic correction, emmetropic in one meridian and +6.0 in the other. On viewing a near object the eye would need to accommodate 4.0 and 4.57 (when $\delta_2 = 15$ mms.) in the two meridians. Sectional astigmatism, if there be such, would be called into play—at any rate, the distance correction would not correct near work. Accommodation should be equalised in the two meridians or what is the same thing the powers in the two meridians adjusted to image the near object in one plane suiting the refractive conditions of the accommodated eye.

D. *Anisometropia and Astigmatism.*

Combined considerations of B and C.

E. If *unsymmetrical* lenses be employed, the accommodation is further modified. Pure variations of form produce small effects in practical negative lens forms. Variations of form of positive lenses produce much bigger changes. The power should be modified to equalise accommodation.

Briefly the present day routine is to correct

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

DUPAUL, YOUNG OPTICAL CO'S

Guaranteed Quality 1/10th 12 carat

"TUBULAR"

Finger Piece Mounting & Finger Piece Frames

are still recognised as the

BEST ON THE MARKET.

Insist on getting

DYO

Finger Piece Mounting and Finger Piece Frames

and you will be sure to obtain

"TUBULAR"

and NOT Coil Spring and Washer construction goods.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7247**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

"BISHOP EYEGLASS CHAINS"

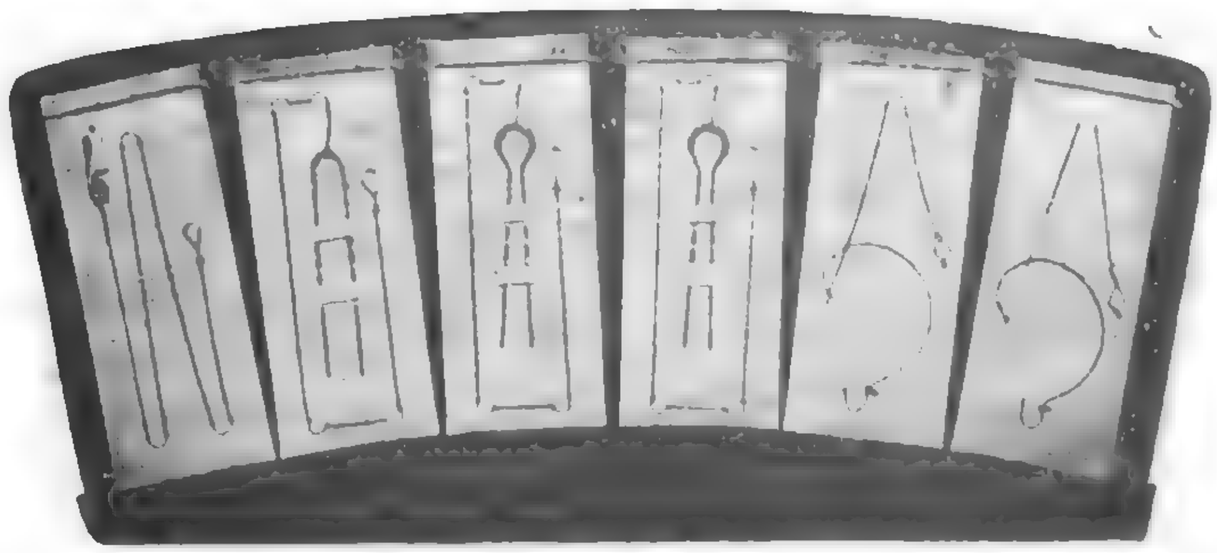
In Gold and Gold Filled

ALSO

SILK EYEGLASS & MONOCLE RIBBONS

are well known to the OPTICAL TRADE and have always been known to give satisfaction. Quality and Finish are evident in all goods of Bishop manufacture and the Bishop trade mark on all chain cards and boxes is your guarantee of absolutely dependancy.

Avoid substitutes, let "BISHOP CHAINS" be your standard of Quality.



THE BISHOP COMPANY,
North Attleboro, Mass.,
U.S.A.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. Telephone: CENTRAL 7241.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

distance vision by placing the retina ultimately conjugate with infinity when the eye is at rest. Both eyes are tested monocularly after which a slight binocular modification may be made. The near vision test is not nearly so rigorous. With the distance correction in position, the accommodation is measured binocularly when if necessary a presbyopic addition is made. A goodly few test for muscle balance whilst the same few realise most of the points raised in this article but make little attempt to allow for them.

The problem is to satisfy the patient for near work. What must be the goal? Magnification effects we will leave until this point is decided. The distance correction is that which renders the eye-spectacle system emmetropic, the retina conjugate with infinity. The writer's contention is that lenses required for near vision should give the same amplitude of accommodation as that enjoyed by the true emmetrope, be he young or old. Equality of amplitude is, to my mind, the condition of near equivalence. If a rigorous near test were possible, *i.e.*, if the accommodation of a patient's eye were controllable, and our knowledge of muscle actions more certain, the problem would become one of direct substitution of equivalent lens (*i.e.*, visual equivalence as I understand Mr. Mayer) and the form-variation factor would only enter into the discussion. A cardinal numbering would help in this respect. The difficulties of a near vision test are well-known and the writer does not know of such a one embodying the conditions required.

Before finishing this statement of the problem, there is one point—I do not press too emphatically that the accommodation should be equated to that exerted by an emmetrope; there is another possibility which I do not think is so satisfactory;—Equalise the accommodation by a modification of one lens only to suit the accommodation of the other eye.

The application of bifocals requires reconsideration in view of the remarks herein made. Solid piece bifocals with astigmatism will be troublesome on account of the different near astigmatic correction. A bifocal of the type suggested by Mr. Jameson (Brit. Pat. No. 10129, of 1912) would permit of the necessary modifications.

[In the next article I hope to show a simple method of determining that lens which accomplishes the above effects, and to give a fairly comprehensive table of vertex marked lenses, both base-curve-vertex and doubly designated back and front vertex, satisfying the above conditions. If my reasoning be at fault, or excessively controversial, I would be glad to receive criticism.]

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

Handbooks Relating to Scientific Instruments.

Sir,—In reply to Mr. W. R. Bone's enquiry, *re* handbooks relating to scientific instruments, in last week's issue of *The Optician*, I should like to mention "Surveying and Levelling Instruments" by Stanley, 1914, published by E. & F. M. Spon, Ltd., 57, Haymarket, S.W.1., as being useful to him. This is not a mathematical publication but it contains a mine of information and is quite practical.

Whilst on the subject of text books, I should like to enquire if you or any of your readers know of any publication which treats on the subject of real and imitation tortoise-shell work as applied to spectacles, etc.

W. Jackson.

41, Elsenham Street, Southfields, S.W.

[The above matter is referred to in our leading notes.—Ed.]

The National Insurance Beneficent Society.

Sir,—My attention has been drawn to the very lengthy communications in your issue of January 6th, on the subject of insurance societies and opticians, and as I feel sure that you are desirous that the opticians of the Kingdom shall have the opportunity of hearing our side of the case, may I ask for your indulgence for the publication of the following history of the negotiations which took place between Mr. Harcombe Cuff, and later Mr. J. H. Sutcliffe, and ourselves.

On July 1st we addressed a communication to a large number of opticians throughout the country, inviting them to serve on a Panel of Opticians that we were then setting up, for the provision of Optical Treatment to a large section of the insured population of the country. With the invitation we enclosed a scale of charges, which we believed to be remunerative, having been so advised by some of the leading opticians of London.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY.

South Kensington, S.W.7.

Department of

OPTICAL ENGINEERING AND APPLIED OPTICS.

The following courses of weekly lectures will be continued during the Spring Session, 1922:

1. General Optics (Elementary), Professor Cheshire, commencing Wednesday, January 18th, at 4 p.m.

2. Advanced Optics, Professor Cheshire and Mr. L. C. Martin, commencing Monday, January 23rd, at 12 o'clock.

3. Optical Designing and Computing, Professor Conrady, commencing Tuesday, January 17th, at 10 a.m.

4. Advanced Designing and Computing Professor Conrady, commencing Wednesday, January 18th, at 10 a.m.

5. Workshop and Testing Room Methods, Professor Conrady, commencing Wednesday, January 18th, at 2 p.m.

6. Construction Theory and Use of Optical Measuring Instruments, Mr. L. C. Martin, commencing Friday, January 20th, at 12 o'clock.

7. Mechanical Drawing and Elementary Strength of Materials, Professor Pollard, commencing Friday, January 20th, at 2 p.m.

8. Mechanical Design of Instruments, Professor Pollard, commencing Wednesday, January 18th, at 12 o'clock.

The following Special Courses will also be given:—

1. Mechanical Design of the Common Microscope, Professor Pollard, commencing on Wednesday, January 18th, at 6.30 p.m.

2. The Spectroscope and some of its Modern Applications, by Professor A. Fowler, F.R.S. (Professor of Astrophysics, Imperial College) on Mondays, from 6.30 to 7.30 p.m., commencing on January 30th, 1922.

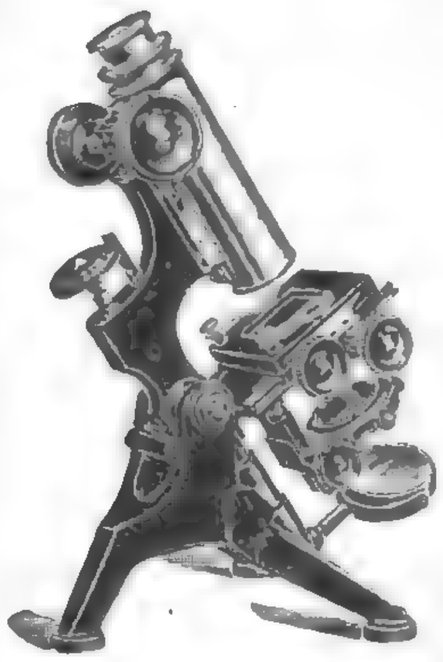
3. Photometry, Mr. L. C. Martin, commencing on Friday, May 5th, at 5 p.m.

For further particulars and for admission tickets apply to Registrar at the above address.

SELL WATSONS' BRITISH-MADE

MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,

313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1837.

Scientific Instrument Makers.

MICROSCOPES of all kinds manufactured at our own works.

REPAIRS to Prismatic and other Binoculars etc., promptly executed.

H. H. SHARLAND (H. KEMP),
9 & 10, THAVIES INN, HOLBORN CIRCUS, LONDON, E.C.
Tel.: Holborn 4940. Established 1868.

Every Description of Ophthalmic Supplies.
All Requirements of the up-to-date Sight Testing Optician.
Good Special Lines at keenly Competitive Prices.

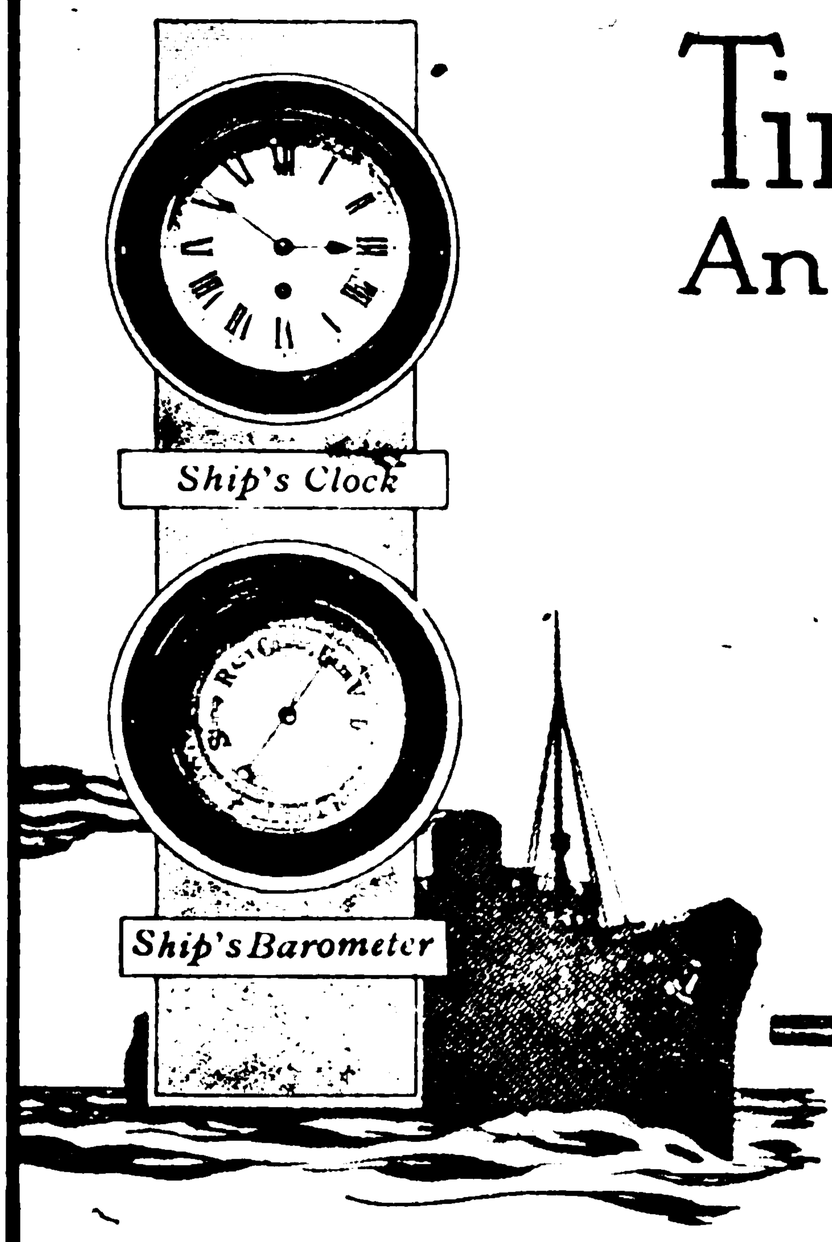
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

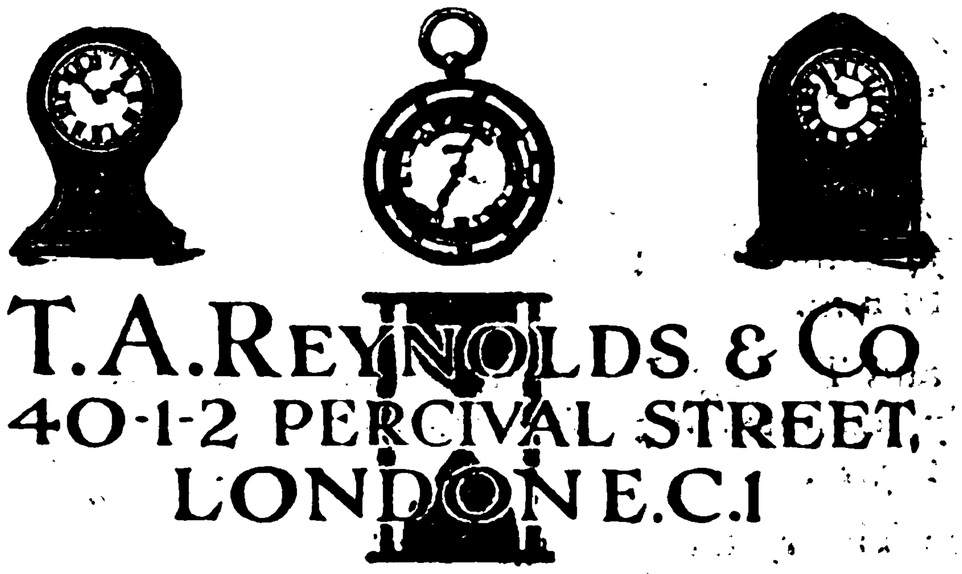
T. A. R. & Co.

"THE ALL BRITISH HOUSE."

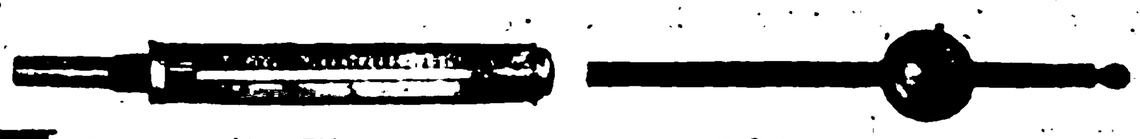
Over 2,000 Designs in Aneroid Barometers.



Time and Tide
And Ship's Instruments



T.A.REYNOLDS & CO
40-1-2 PERCIVAL STREET,
LONDON E.C.1



Steam-pipe Thermometer — *Hydrometer*

Telegrams—
"THERBAROME. LONDON."

Telephone—
399 CITY.

Showrooms and Offices at above address.

If you are a Retailer and need ORIGINAL LINES in Barometers, Clocks and Thermometers, write us, and although we will not supply you direct, we will put you in touch with the Nearest Wholesale House.

WHOLESALE AND SHIPPING TRADE ONLY.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Following the issue of this circular I received on the 15th July a communication from Mr. Harcombe Cuff, asking if I would kindly grant him an interview at the earliest opportunity on the subject of our letter.

The interview took place, and I was asked if my colleague, Mr. Rockliff and myself, would meet the Council of the I.O.O. on July 28th, with a view to an agreement being come to.

We met on July 28th, and in the course of the discussion which followed, the statement as to the 300 per cent. minimum profit was undoubtedly made, as I hold a letter from Mr. Harcombe Cuff in which he charges us with breach of confidence for publishing the fact.

The negotiations which took place with the Council of the Institute were quite friendly; and my colleague and myself requested the Council to draft alternative proposals as a basis for negotiations. This they promised to do.

As proof of the friendly negotiations that were then taking place, we were able to convey certain important information to the Institute, which had a very material effect upon the business of opticians generally, and at the request of Mr. Cuff I furnished him with the data in connection therewith.

Further, I came to an arrangement with Mr. Cuff, that pending a final agreement, I would meet the opticians' usual charges in any case where I was requested to so do; and on this understanding Mr. Cuff supplied me with a printed list of the whole of the members of the Institute. This bargain I have carried into effect, as many opticians throughout the country who accepted service on our original Panel, can verify.

Not hearing anything as to the suggested alternative proposals, I telephoned on three or four occasions as to how the matter was proceeding, and each time Mr. Gregg, the Assistant Secretary of the I.O.O., informed me that the matter was still under consideration.

On the 15th September I received a communication from Mr. Cuff, saying that he regretted he was unable to write me as promised but the matter was being carefully considered not only by the Council of the Institute, but in conjunction with other bodies of qualified opticians, and he hoped to write me fully within the ensuing week.

Not another word did I receive until the printed scheme, as agreed upon by the I.O.O. and the B.O.A. came to my hands in the ordinary course of issue.

I immediately telephoned Mr. Cuff, and asked why it was the scheme had not been submitted to us, as a basis of negotiation, as originally agreed upon. He disclaimed any responsibility for its issue, simply saying he had received instructions to issue it. I suggested that this was hardly fair in view of the negotiations that were then supposed to be taking place, and I asked if it would be possible still to negotiate on the terms set out therein. Meanwhile, I was being inundated with letters from opticians in all parts of the Kingdom, informing me that they were willing to serve on the Panel under the terms of the agreement they had received, signed by Messrs. Cuff and Sutcliffe, which we had never seen, and did not see until after it had been circulated.

It was then suggested that I might meet Messrs. Cuff and Sutcliffe in consultation, prior to the circular being issued to all Approved Societies. I agreed to the suggestion, and met Messrs. Cuff and Sutcliffe at Grays' Inn. Immediately I sat down I was told by Mr. Sutcliffe that he had no intention of negotiating. Their terms were contained in the circular letter, and I could accept it or leave it. My reply was to the effect that no useful purpose would be served by my remaining. He further suggested that the B.O.A. were very desirous of eliminating the commercial side of optical business, and were concentrating on securing recognition of their professional status.

Throughout these proceedings Mr. Cuff was conciliatory, and I suggested that as Mr. Sutcliffe was so eager for the professional status to be recognised, we would pay a professional fee, but we should not be prepared to pay a professional fee plus ordinary profits on the commercial side.

Mr. Sutcliffe suggested a fee of half-a-guinea, but I informed him we could not consider such a proposal, as we were obtaining Harley Street Specialists' prescriptions at a less cost.

As a result of the interview Mr. Cuff visited my office two or three days afterwards, and brought with him two copies of his own draft on the points agreed upon at that interview. He asked me to read them, and if I agreed to sign one and hand it back to him, and he would sign the other and hand it to me.

I accepted, without alteration, his draft, and the exchange of copies, duly signed, took place.

The following is an exact copy of what I hold signed by Mr. Cuff:—

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"INSTITUTE OF OPHTHALMIC OPTICIANS.

"Staple Inn Buildings,
London, W.C.1.

"Secretary:
Mr. J. Harcombe Cuff, F.S.M.C.

"Asst. Secretary:
Mr. F. T. Gregg, M.A., F.I.S.A.

"OPTICAL TREATMENT CONFERENCE.

"Points agreed upon at a Conference held on Wednesday the 2nd November, 1921, between Mr. G. W. Canter, representing the National Insurance Beneficent Society, Mr. J. H. Sutcliffe, representing the British Optical Association, and Mr. J. H. Cuff, representing the Institute of Ophthalmic Opticians, and upon which it is suggested an agreement may be made between the three societies represented.

1. The N.I.B.S. will send all members of Approved Societies connected with it, who desire optical treatment to opticians holding one or more of the Diplomas of the Spectaclemakers Company, or the British Optical Association and to them only.
2. The service to be rendered only by opticians actually holding the Diplomas of the S.M.C. or the B.O.A., and the person doing the sight-testing shall sign any certificate or document required by the Society with the addition of the initials or full description of his membership of those bodies, or of the I.O.O.
3. The N.I.B.S. will give the insured person the opportunity of selecting the optician to whom he shall go, and wherever, possible will give effect to the wishes expressed.
4. The N.I.B.S. will pay a fee of 5s. for each person sent, and (where glasses are supplied) the price of the glasses. All glasses to be charged at the prices set out in a Standard Prescription List to be agreed upon by the N.I.B.S., the B.O.A. and the I.O.O.
5. All accounts to be paid monthly; and in consideration of the fact that the glasses are to be supplied at list price the N.I.B.S. undertakes that all prices shall be strictly confidential between the society and the optician.
6. The optician shall be free to see the patient by appointment,
7. Any dispute under this agreement shall be referred to a Committee consisting of an equal number of representatives of the opticians, appointed by the B.O.A. and the I.O.O., and of the N.I.B.S."

Naturally, I assumed, that having signed such a document I, as well as the signatories on the opposite side, would loyally carry into effect the agreement. Judge my surprise at the receipt of the following from Mr. Cuff, dated 18th November, 1921:—

"Staple Inn Buildings,
London, W.C.1.
18th November, 1921.

"To the Secretaries,
"The National Beneficent Society.

"Dear Sirs,—I have to inform you that at the meeting held here yesterday, it was resolved that the suggestion made by you at the recent Conference could not be entertained, and that the Scheme as originally drawn up by the British Optical Association, and this Institute, be sent to all approved societies.

"Yours faithfully,
"(Signed) J. HARCOMBE CUFF."

As a result of such deliberate, and apparently intended action to cut off negotiations, our circular dated November 30th was issued, and the following letter sent to Mr. Cuff:—

"J. Harcombe Cuff, Esq., 21st Nov. 1921.

"Dear Sir,—I beg to thank you for your reply of the 18th, informing me that at the recent Joint Conference of your organisation and the British Optical Association, the suggestions made by me, as a basis of negotiation, were rejected.

I very much regret to hear this, as I assure you we were anxious to come to an agreement with you in the same way as we have been able to with the British Dental Association.

However, as you have decided to slam the door we have no alternative but to seek other services.

Meanwhile I may say that we are advising all Approved Societies in the country, who are giving optical treatment as an additional benefit, to ignore your circular as we are able to offer them a much better and cheaper service.

"Yours faithfully,
"(Signed) G. W. CANTER."

The circular has furnished us with a Panel of 600 opticians throughout the country, which is ample for our requirements at the moment, although it has to be recognised that the de-

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

NOT HOW QUICKLY—
NOT HOW CHEAPLY—
BUT HOW BEST TO SATISFY
OUR CUSTOMERS
is the Guiding Motive in our Work of Supplying the Rx Needs of Britain's Leading Opticians.

Nevertheless, speed is not sacrificed—nor is cost increased—by our adoption of this policy. Rather the reverse.

You can entrust to us all the tests you make in the confident knowledge that your clients will pay tribute to your skill when they receive from you the eye-glasses you have prescribed.

Enhanced prestige and greater goodwill follow as a matter of course—to your and our benefit.

Telephone: CENTRAL 4572

LONDON OPTICAL Co.,

Offices and Works:
344/354, GRAY'S INN RD., LONDON, W.C. 1
Factory—CROMER STREET, LONDON.
Branch—6, Rue de la Pepiniere, Paris, France.
Also at—2, Str-Bursei, Bucharest, Roumania.

Telegrams: Locoptical Kincross London.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

UNCUT LENSES

OF EVERY DESCRIPTION

QUALITY AND PRICES DEFY COMPETITION

WRITE FOR OUR

LATEST PRICE LIST

OUR RX DEPARTMENT IS UNEQUALLED FOR

PROMPTNESS & ACCURACY

Telephone: HOLBORN 1620 (Private Exchange).

KIRK BROTHERS

WHOLESALE & MANUFACTURING OPTICIANS

Telegrams: KIRKBROTH, HOLB. LONDON.

36, GRAY'S INN ROAD, LONDON, W.C.1

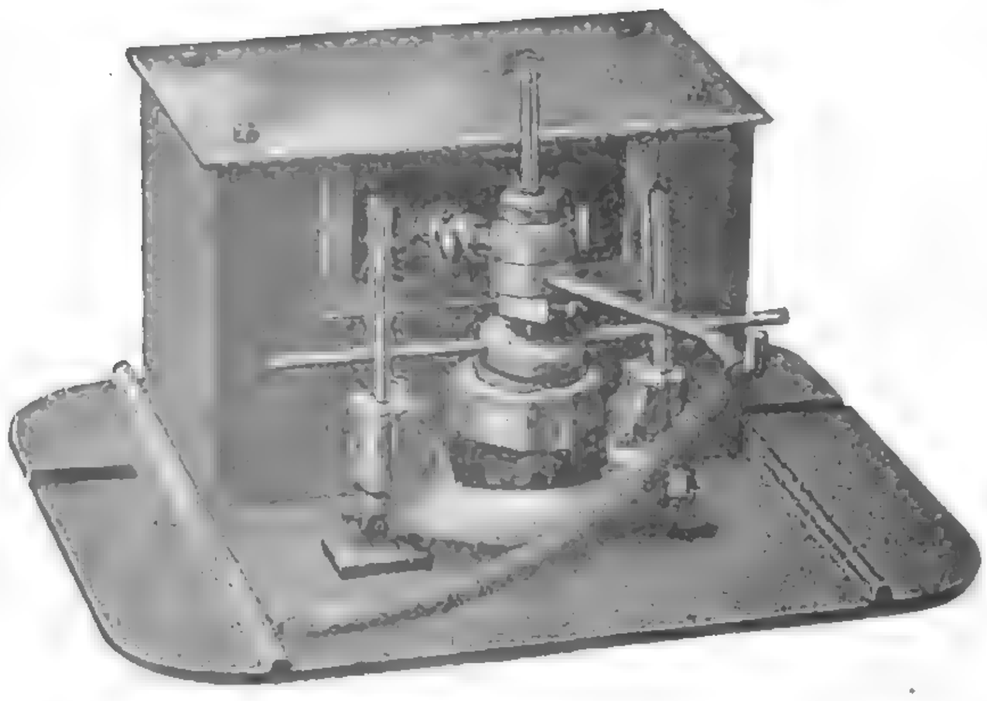
"SOMCO"

AUTO-SURFACING MACHINE.

PATENTED IN
GREAT BRITAIN
U.S.A.
FRANCE
GERMANY.

LONDON
MADE.

Ask for Quotations.



Requires Only 1/6 H.P.

TOOLS
GAUGES
SURFACING
SHOP EQUIPMENT
OPTICAL MACHINERY & INSTRUMENT REPAIRS.

SURGICAL & OPTICAL MFG., Co.,
22, Union Road,
Clapham, London, S.W.4

OUR STAND AT THE BRITISH INDUSTRIES FAIR WILL BE E 18.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

mands made upon us by the societies for whom we are acting, is an ever increasing one, *e.g.*:

One society for whom we are acting, whose membership is considerably over 100,000 has concentrated on one small town in the Midlands, where it has a branch of less than 200 members, with a view to ascertaining the optical requirements of its members in this town, with a result that over 40 cases of defective vision have been found, and one optician in the town, a member of the B.O.A. and the I.O.O. has had 10 cases submitted to him within the past 6 weeks. He had accepted service on our original Panel; thus payment has been made to him on the terms set out in the original circular over the signatures of Messrs. Cuff and Sutcliffe, and only now am I approaching him to ascertain whether he is willing to accept service under the scale which we have agreed upon with the National Association of Opticians, whose members are accepting honourably the agreement entered into by their officials on their behalf.

May I add in conclusion that throughout the whole of the negotiations my relationship with Mr. Harcombe Cuff was always friendly, and it was not until a second gentleman was introduced into the proceedings that the impasse came about. For this I disclaim any responsibility. The slamming of the door upon negotiations was by the I.O.O. and the B.O.A. and not ourselves. We were never given the opportunity to negotiate.

I am still prepared to re-open negotiations if the I.O.O. agree to approach me, but I am not prepared to negotiate if the same gentleman is to represent the views of the B.O.A.

Please excuse this lengthy communication, but I am anxious that the full facts shall be placed before the opticians of the Kingdom, as I believe that an honourable agreement will be a real advantage to the three parties concerned, the optician, the insured person, and ourselves.

G. W. Canter.

Bank Chambers,
1, Wandsworth Road, S.W.8.

The Proposed Optical Panel.

Sir,—May I reply to a portion of Mr. Honeyman's letter in issue of last week, which is misleading?

He says "the work will mean much more when in full swing, . . .as most cases will want a better quality article, and will . . . pay extra."

Now, the terms (N.I.B.S.), are quite plainly stated, that the goods shall be supplied at wholesale cost price; so that if patient decides to have a better quality article, the optician will not benefit thereby—he will get merely the five shillings fee; and he will have spent about a shilling of this in postages, stationary, etc.; and will have laid himself open to criticisms regarding charges and possibly quality of work, that may entail correspondence.

Anyone who tries to give the impression that there will be opportunities of profit in supplying the better class articles, is misrepresenting the matter—there will not. And those who agree to do this work, on the terms offered will, I feel sure, regret it afterwards.

Herbert Smith.

12a, Lower Hillgate, Stockport.

Sir,—Re Mr. David Honeyman's letter in yours of the 13th inst.

There are serious reasons to believe that many opticians will be mis-led through lack of knowledge of the true facts. Perhaps it would surprise most were they to know that this Optical Scheme or Panel is not a National Scheme, but an idea of private individuals, who are not able in any way to influence National recognition for opticians.

If it were such a fine scheme it would have been taken up by the doctors. Also the qualified opticians would have snapped at it when offered exclusively to them. Now it is offered to those who have not passed optical examinations, and I expect the threat still holds good—*i.e.*, if the opticians do not take this offer the hospitals will be approached to accept.

Why work or be coerced under a threat—let it go to the hospitals, who would not work at the fees offered.

Perhaps the action of the qualified dentists when approached with a somewhat similar Dental Panel Scheme would interest all opticians.

Now in the case of the National Insurance Act, employees who are above a certain age, and in receipt of wages below a certain amount, are compelled to insure. Doctors who are on the Insurance Panel receive a fee per insured person on their Panel.

The Rx is taken to a Chemist on the Dispensing Panel, and he charges the cost of what is supplied to the Health Insurance Authorities.

The Doctors would not attend to patients under the National Health Scheme, were it

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

not for the retainer per insured person. Were the Optical Panel a National Scheme, opticians could be similarly treated to the doctors, as most people require optical treatment.

For some unknown reason we have not (as far as I know) been told the total of insured people who would be coming for glasses, but whatever the number they are only part of the insured people, and the same who now come for optical aids, and so we would be losing profits, and as a business proposition it is not worth a moment's consideration, furthermore it brings no extra clients.

There are many approved societies, some few of which whose total membership I have not seen disclosed, desire to dispense surplus accumulated funds in giving their members extra benefits.

Why do they not make it an extra Sanatorium Benefit, and until the optician can be offered an actual National Scheme (like the doctor) leave him alone.

The N.A.O. have not been approached to do this work by any Government body.

Perhaps someone can explain how they would get National recognition.

JOHN.

Early Sight Testing.

Sir,—With reference to "Early Sight-Testing" by Mr. G. Braham, which appeared in your esteemed journal some weeks ago, I venture to state that according to my knowledge there are no examinations to pass in optics in Calcutta. I have practised as an optician in Indian and China for the last 16 years, and if there had been such examinations to pass I would have certainly been delighted to have taken the opportunity. It is bad enough to think what will happen to opticians if the Sight-Testing Bill becomes law, because it will spell ruination to many, unless they are in a position to leave their businesses and proceed to England to take their course in visual optics and sight-testing. What I will vouch for as regards Mr. Braham, is that he did practice as an optician during the period (*sic*) of 1879 with the late Mr. N. Lazarus.

H. LAZARUS.

Penang, S.S.

[The above letter in no way disposes of Mr. Braham's claim to have passed an examination, in 1879.—ED.]

Payments for Services.

Sir,—It is quite amusing some of our qualified opticians to have their brains valued at 5s. per test; but is it not true that some watchmakers after five or six months' course, have become qualified opticians?

What about those employed in the wholesale? The surfacer, for instance, must have brains trained to every part of optics, which takes years to make a skilled man. He must have the knowledge as to (1) refractive index of glass; (2) temperature of pitch; (3) formula for working prisms; (4) neutralising; (5) what substance blank to use; (6) thickness to leave lenses; (7) transposing; (8) to wash emery; (9) to know prescription errors; (10) setting; (11) tool turning; (12) machine repairing in general; and yet we value this man's brains at £4 10s. a week, to do 30 surfaces at day; or piecework at 7d. a surface all-round. Yet a scavenger's wage is £5 per week.

If a skilled surfacer does 170 surfaces per week at 7d. per surface his wage is £4 19s. 2d., whereas if you test 170 sights at 5s. per test, you will take £42 10s.

In the optical trade a man is paid for his production, not for his brains; and if there is not any work, there is short-time for the surfacer.

N. ROCKLEY.

Arundel Square, London, N.

[It is perhaps open to question whether many surfacers either have or need have quite such a range of capabilities and opto-technical knowledge as is indicated or suggested above. The operative's skill is often narrowly specialised, and remunerated accordingly. If scavengers are paid at the rate quoted, presumably that is because they have the good fortune to be in an uneconomic employment, lavishly paid at the public expense. Sight-testing and fitting glasses requires perhaps half-an-hour for each case; and of course the work is not continuous.—ED.]

At Gordon Hill, Enfield, on Saturday, Jan. 14th, the Bondwell F.C. (C. W. Dixey & Son) completely outplayed the home team, despite having to make five changes owing to injuries. The "Bees" forwards were irresistable, and scored with ease from every combined movement at regular intervals. The home side had a fair share of the exchanges, but their ragged finishing was well met by the opposing defenders. It was a keen and sporting game. Result: Great Northern Railway A.A. F.C., 2; Bondwell F.C., 10. The record of the Bondwell F.C. to date is, Played, 12; won, 6; lost, 3; drawn, 3; goals for, 43; against, 32. On Saturday, Jan. 21st, Bondwell F.C. oppose Blooms' (Opticians) Athletic F.C. at home, Lea Bridge Road. Supporters meet at Radley's Boathouse. Kick-off, 2.45 p.m.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

ELLIOTT'S Rx SERVICE

AIMS AT PERFECTION.

The following are two specimens of many unsolicited testimonials which we are constantly receiving, and they speak for themselves.

31/12/21.

"Dear Sirs,

Just a word of thanks for returning the whole of the sixteen jobs sent on the 29th.

They were all correct in every respect, and my clients were agreeably surprised to receive them in the holiday week.

Yours faithfully,

....."

13/1/22.

"Dear Sirs,

I should like to thank you for your very efficient and prompt Rx service during 1921.

We sent you **2242** jobs and never had one error.

More than this could not be desired by any one, and your system must be perfect.

Yours truly,

....."

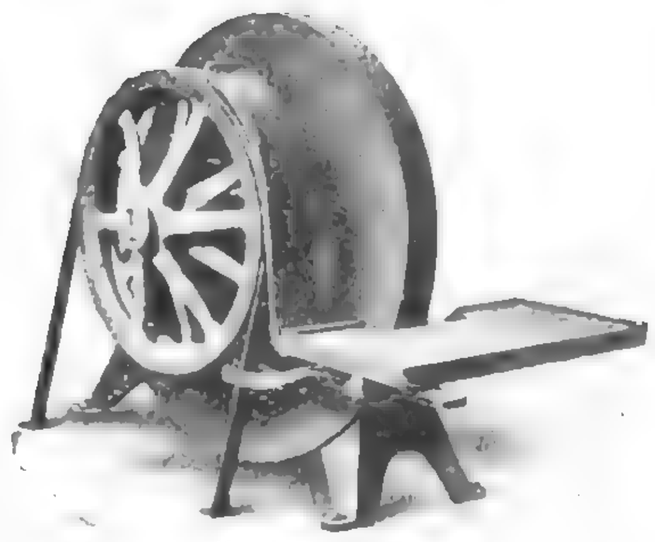
We are at your disposal and shall appreciate the opportunity of including you amongst our very large number of *satisfied* clients.

ELLIOTT OPTICAL COMPANY,

104/105, Gt. Saffron Hill, London, E.C.1

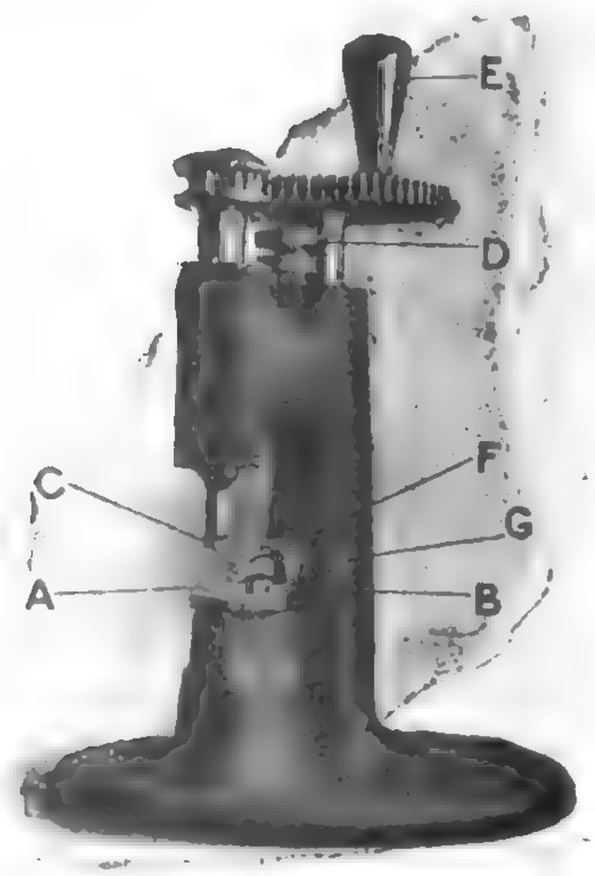
Digitized by Google Original from THE OHIO STATE UNIVERSITY

OPTICAL MACHINERY



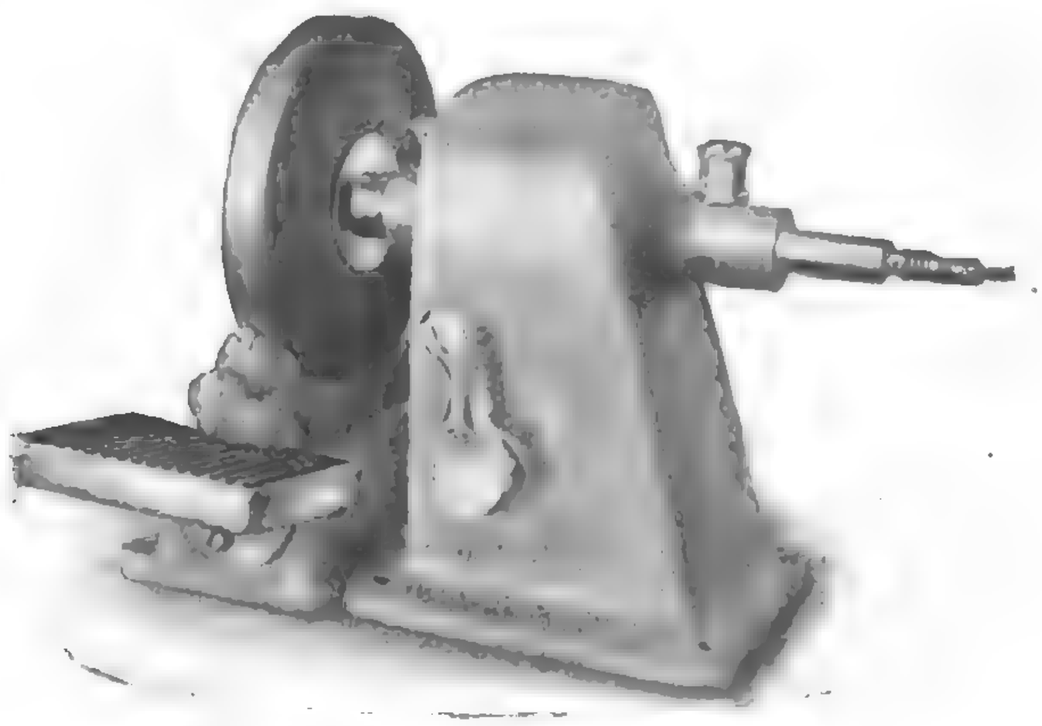
POWER EDGING MACHINE.

Measurements of Stone:—10 ins. Diameter by 1 in. Face. Complete with fast and loose pulleys.



HAND DRILLING MACHINE.

Complete with best quality Diamond Drill. Full instructions sent with each.



FINISHING MACHINE.

Illustration shows machine complete with Alundum wheel on one end of Spindle and a screw-finishing Machine on the other side. The following extra tools can be fitted:—Carborundum Wheel for edging lenses; V edge Stone for milling; Tapered Screw for fitting brushes and felt wheels for polishing frames; Diamond Drill; Solder Iron, etc.

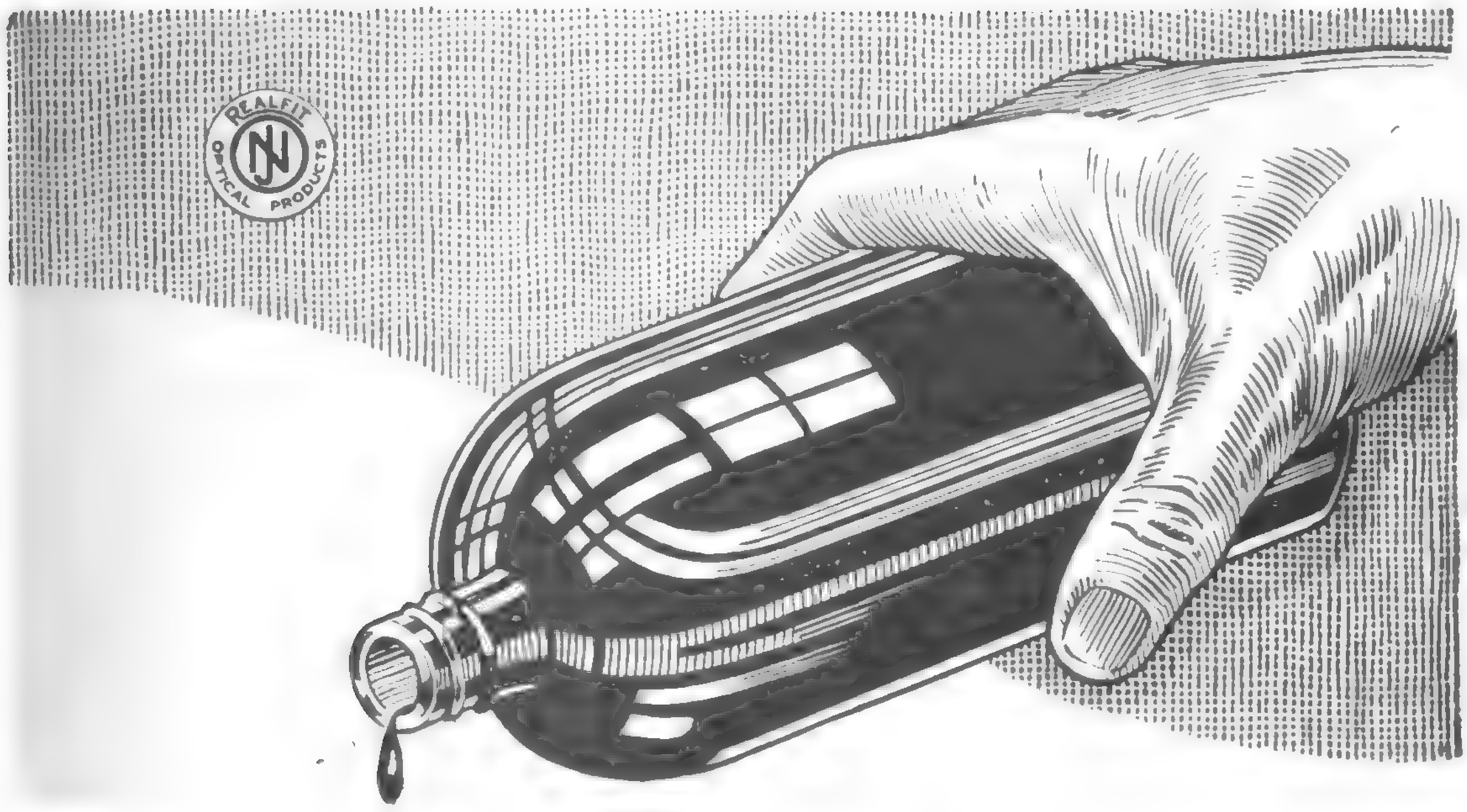
Write for particulars. ***Delivery per Return.***

JOHN BAIRD,
Manufacturing Optician,

"HERALD" OPTICAL WORKS,
68 & 70, MITCHELL ST., GLASGOW.

Telegrams: "SPECTACLES, GLASGOW." ***Telephone: CENTRAL 541.***

Digitized by Google Original from THE OHIO STATE UNIVERSITY



The hand of Time applies the acid test to merchandise and men. Many are found wanting; they fall by the wayside. A few possess that element which men call QUALITY. Time cannot efface their greatness.

REALFIT Finger Piece Frames and Mountings are Quality products. Whether you buy to-day or next month, *always* you can be certain of their uniform high standard—of their comfort, beauty and enduring strength.

The best material is used throughout. Every part of the mounting is constructed with great precision.

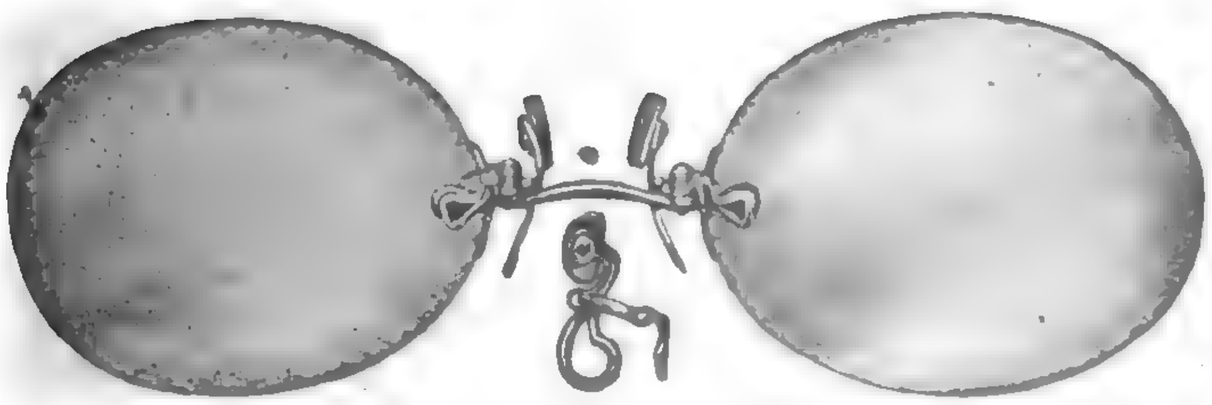
No less than five inspections testify to the care exercised that no REALFIT should leave our factory unless it is absolutely perfect.



REALFIT

Finger Piece

Mountings and Frames.



Made in all standard sizes with a complete assortment of Guards. If your Wholesaler cannot supply you, write us.

NEW JERSEY OPTICAL Co.,
Newark, N.J. . . . . U.S.A.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

F. BARKER & SON, LTD.

SUNDIAL HOUSE,

12, Clerkenwell Road, LONDON, E.C. 1

Regiate

Trade Mark

Estab. 1848

MANUFACTURERS OF ALL CLASSES OF

SCIENTIFIC AND OPTICAL GOODS.

MANUFACTURERS OF

Aneroid Barometers, Compasses, Drawing, Mining, Surveying & Scientific Instruments of Every Description.

Illustrated and Descriptive Catalogue Post Free to any part of the World. Illustrated Booklet upon Sundials, Barometers and Compasses, Post Free. LISTS FREE.

Correspondence Invited. Bankers' and Trade Referesces.

CLINICAL THERMOMETERS A SPECIALITY

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,

DANDURAND BLDG., MONTREAL.

Cable "Optical" A.B.C. Code 5th. Edition.

A New Optical Publication.

"PRESCRIPTION PITFALLS

and How to Avoid Them,"

By HENRY C. RAXWORTHY

("Obfuscando")

ONE SHILLING AND SIXPENCE.

No Retailer or Wholesaler should be without a copy. An entirely original work.

Published by The HATTON PRESS, Ltd., and obtainable of all wholesalers.

Telephone **JAMES B. SLY,** Central 10220.

9 & 10, EDWARD ST., WARDOUR ST.

LONDON, W. 1

To S.M.C., B.O.A. & I.O.O. DIPLOMA HOLDERS

Oak frames and modelled gold Arms for the diplomas The Arms of the S.M.C., City of London, and devices of the I.O.O., B.O.A. and Ph. Society in water colours, and framed dark oak, with descriptive engraved plate affixed, 27/6 each. Packed and put on rail.



Electro No. 12 Price 3/6

Printed & Embossed Optical Stationery.

Steel Dies for use of Diploma Holders.

Electros of Coat of Arms & Optical Devices.

Engraved Seals, Prescription Forms, Signs, etc.

Price List on application.

The Optician's Handbook.

Price 4s. 0d. Post Free.

An elementary text book required by every student of Optics.

It is an introduction to "The Study of the Refraction of the Eye, its Anomalies and their Estimation and Correction by means of Glasses.

The Hatton Press, Ltd.,

125, Fleet Street, LONDON, E.C.4

Worshipful Company of Spectaclemakers.

Tuition for the Company's Examinations in Optics and Sight Testing at

THE SCHOOL OF OPTICS Ltd.

2, GUILFORD PLACE, LONDON, W.C. 1

Particulars on application.

VISUAL OPTICS & SIGHT-TESTING

By LIONEL LAURANCE.

A New Edition, just out. Price 21s. 21s. 9d. post free.

GENERAL AND PRACTICAL OPTICS

By LIONEL LAURANCE.

A New Edition. Price 21s. 21s. 9d. post free.

The two ideal books for the acquirement of a knowledge of the subjects indicated by their titles.

THE HATTON PRESS, Ltd.,

125, Fleet Street, London, E.C.4

BRITISH OPTICAL INSTITUTE, LTD.,

(College of Optics).

Complete Training for the Sight-Testing Optician.

Supplementary to the usual Daily Classes and Correspondence Courses, a series of Evening Classes is held, for those desirous of preparing themselves for any of the Optical Examinations.

A Course of Weekly Evening Lectures, and Demonstrations, for candidates for the F.B.O.A. Examination, and for post-graduates, has also been arranged.

Clinical Classes.

are held on two afternoons a week, and give Students the special advantage of meeting actual cases, generally of particular interest.

The whole work of the Institute is carried out under the supervision of the Principal, assisted by Mr. Geo. Colebrook, F.B.O.A., F.S.M.C., (Master's Prizeman).

For full particulars apply to:—The Principal, Dr. MAX COQUB, B.Sc., Fern Lodge, 20a, Grove Road, Brixton, S.W.9

Telephone: Brixton 677.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Say "Shur-on" to your Wholesaler!

¶ It is the name of a family of optical products covering more than 996 styles and types of eyeglasses, spectacles and cases.

¶ It is your guarantee of Quality—of a Quality which has been beyond question—ever since 1864.

¶ It is your strongest sales ally, for every time you deliver a mounting, bridge or case bearing the Shur-on imprint to a patron, you are delivering 100 per cent. satisfaction. You are planting the seed of a word-of-mouth goodwill, which will prove of inestimable value to you.

¶ Be critical—say "SHUR-ON" to your wholesaler. Shur-on products cost no more than ordinary kinds.

Shur-on Optical Co.,

Rochester, N.Y.,

U.S.A.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d. per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

WANTED Trial Case, good condition, cheap, accessories. Tildesley, "Orthops House," Saltburn.

BARGAIN New Lens Drill just as delivered, never used, approval willingly. Box 3520, c/o "The Optician," 125, Fleet Street, E.C.4.

4-SPINDLE Block Machine for 12-inch. tools, by Tanner. Also 6-spindle Automatic Polishing Machine by Sherwood, for sale. Guaranteed perfect working order. Apply, 3503, Goswell Road, E.C.1.

SIMPLEX Rimless Edging Machine for sale. £16 10s. Worcester ditto. £21. Lancaster & Thorpe, Opticians, Derby.

INSTRUMENT WORK Wanted. Experimental or repetition. F. E. Boynton, 391, St. John Street, E.C.1.

FOR SALE. Half-plate stand camera, mahogany, 10" ext. Beck-Steinheil Unofocal Ser. 1., No. 5. f/6 with Beck Celverex shutter, T.B. to 1/80 sec., 3 mahogany double dark slides, stand, focusing cloth, waterproof case, the whole £3 10s. Also ¼-plate Holborn reflex, magazine 12, Ilex, R.R. f/77. T. and I to 1/100 sec. Leather case, £2. Please address, Box 3508, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

OLD-ESTABLISHED Sight-testing business for sale, takings guaranteed over £1,200. Freehold. Living accommodation, main street, bear strictest investigation. Box 3521, c/o "The Optician," 125, Fleet Street, E.C.4.

M.P.S., F.S.M.C., F.I.O., desires interest in a business either where the double qualification is essential or sight-testing only. Box 5830, c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 8*

WANTED Hand for stockroom with prescription experience preferred. Also all-round jobber. Seymour Optical Co., 3 and 4, Barrett Street, Manchester Square, W.1.

MANAGER or first assistant requires berth, good refractionist and able to take full charge of workshop, excellent references. Apply Box 5826, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS Lens Surfacer requires situation, 9 years' experience with London firms. Apply, J.S., 80, Prebend Street, Islington, N.1.

APPRENTICESHIP required for a well educated youth, with well established provincial optician, to live in. 118, Wellington Road, South Hounslow.

QUALIFIED and Experienced manager required for shop in South Wales. Welshman preferred. Permanent position. Write in confidence giving full particulars and salary required to Box 5833, c/o "The Optician," 125, Fleet Street, E.C.4.

The Optical Society.

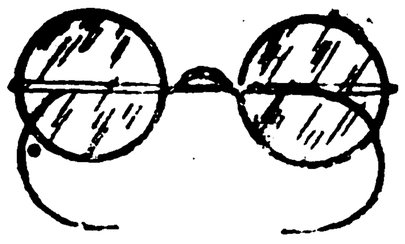
President: Mr. R. S. Whipple, M.I.E.E.
Vice-Presidents: Prof. Frederic J. Cheshire, C.B.E., Director of the Technical Optics Department of the Imperial College of Science and Technology, South Kensington; Sir Herbert Jackson, K.B.E., F.R.S.
Hon. Treasurer: Mr. I. G. Aitchison, B.A., LL.D.
Hon. Secs.: Mr. L. C. Martin, B. Sc., Imperial College of Science and Technology, South Kensington S.W.7 and
Papers' Secretary: Mr. F. F. Bryson, M.A., B.Sc.

PATENTS.

The owners of Patents No. 14551 of 1914, relating to "Improvements in spectacles, goggles, and the like for producing from artificial light the colour effect of daylight," and No. 20827 of 1914, relating to "Improvements in colour screens for artificially producing daylight," are desirous of negotiating with interested parties for the granting of licences thereunder on reasonable terms.

For information apply to:—Messrs. Lloyd Wise & Co., Chartered Patent Agents, of 10, New Court, Lincoln's Inn, London, W.C.2.

FOR SALE.
Six Craigleith Optical Grindstones.
Three size 22" diameter x 2½" face and three size 22" diameter x 1½" face complete with Pulleys to run by power fast cutting and good finish put on edge of lens at same time. *For immediate disposal.*
Prices on application to—
JOHN BAIRD, Manufacturing Optician, 68/70, Mitchell St., Glasgow.



OPTICAL BLOCKS
To illustrate all features of Optical Service. Write for Lists.
CHEMISTS' DESIGN SERVICE,
12, Humberstone Gate, LEICESTER.

PERCY S. DE SAULLES.
Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES.
Micro Cover Glasses, Glass Cells and Cavity Slips, etc.
The Platts, Amblecote, Stourbridge.

BAKER 244 HIGH HOLBORN LONDON
Estab. 1765
Microscopes & Accessories
PHOTOMICROGRAPHIC APPARATUS, APLANATIC MAGNIFIERS, Etc.
WRITE FOR LIST AND TERMS, Post free on application.

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
C. S. DYMOND, M.I.Mech.E., F.I.C.P.A
W. P. THOMPSON & CO.,
12, Church Street, Liverpool.
Chartered Patent Agents.
H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG, M.T.I., F.I.C.P.A.

T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and ABRONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
Established 1878 Telephone City 419

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

A Stoco Workroom Outfit
Is an Aid and an Objective

The plans for development and expansion which are naturally foremost in the mind of the progressive optician at this season invite consideration of the flexible character of Stoco Workroom Outfits.

Elasticity is a predominate feature of Stoco Workroom Outfits and is perhaps the most important single reason why they are to be found in so great a percentage of the optical establishments of the world.

Each Stoco Outfit is designed to care for immediate production at a minimum cost and to provide for the expansion which its influence on service almost inevitably brings out.

The installation of a Stoco Workroom Outfit at this time therefore resolves itself into more than a purchase of necessary equipment. It is a step toward greater efficiency and the knowledge of the maximum productive capacity it offers is a constant spur to the worthy ambition of making the business grow up to the equipment.

Manufactured by

THE STANDARD OPTICAL Co.,

GENEVA, N.Y., U.S.A.

Makers of High Grade Frames, Mountings, Lenses and Optical Machinery.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

***A.*—Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

ASSISTANT qualified for sight-testing, London. Send full particulars, photo, salary required to Box 5832, c/o "The Optician," 125, Fleet Street, E.C.4.

RELIABLE refractionist, keen business man, 12 years' experience, seeks re-engagement as branch manager or assistant. Passed part B.O.A. Highest references. Box 5831, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, well educated, requires position. Passed preliminary F.S.M.C. Thorough knowledge of sight-testing. Box 5830, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED Assistant (21) all-round workshop and sight-testing experience, seeks re-engagement. F.S.M.C., 59, Eden Street, Kingston-on-Thames.

POSITION wanted by qualified refractionist, high-class experience, excellent credentials. Good appearance and address. Disengaged. F.B.O.A., F.S.M.C., 20, Somerville Road, Bristol.

REFRACTIONIST, over 20 years' sight-testing experience, retinoscopy, etc. Good salesman, seeks engagement. Reply, Optician, 78, Durham Road, Sparkhill, Birmingham.

QUALIFIED Refractionist (F.B.O.A.), requires post as manager or first assistant. Quick and accurate refractionist, good salesman, first-class experience. Excellent credentials. Casson, 11, Elmwood Grove, Mount Street, Batley.

WANTED to manage office, assistant with wholesale experience, shorthand typing an advantage. Letters, Ross-Jenkins, 31, High Holborn, W.C.1.

CAPABLE Assistant in need of berth requires position with retailer. All jobbing repairs, etc. London or Provinces. F. Gasson, 52, Battersea Park Road, S.W.11.

QUALIFIED Optician wanted to open branch in small country town. W., c/o Brazier, 64, Warstone Lane, Birmingham.

WELL-ESTABLISHED wholesale house require two representatives, preferably with connections. Reply, in confidence, to Box 5828, c/o "The Optician," 125, Fleet Street, E.C.4.

OPTICIAN'S Son, between 20 and 21, passed B.O.A. examination, certificate in November. Capable refractionist, thoroughly practical, gentlemanly address, desires position, North preferred. Box 5827, c/o "The Optician," 125, Fleet Street, E.C.4.

SPECTACLE Manufacturer seeks **representative for wholesale.** Grenier-Peclet, Les **Rousses, Jura, France.**

QUALIFIED Assistant, 21, seeks re-engagement, 2 years' sight-testing experience. Thorough knowledge of optical workshop. F.S.M.C., 59, Eden Street, Kingston-on-Thames.

YOUNG MAN, 20, desires position with good-class firm of opticians, 2 years' experience. Passed Prelim. S.M.C. Knowledge of sight-testing. Reply, Box 5820, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN, 27, requires situation in retail optical business as learner. No previous experience. Can do book-keeping, etc. Box 5810, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, 18, requires situation, good knowledge of optical repairs and photography. Home or abroad. Box 5804, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST seeks position where he could gain experience in edging, drilling, etc. Careful and conscientious worker. Box 5807, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED refractionist and salesman (27) requires position as manager or first assistant. Knowledge of photography. Last position 10 years. Apply, Box 5808, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN requires situation in retail opticians. Four years' experience factory and sight-testing. London or district preferred. Box 5809, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. with good all-round experience requires position as manager or first assistant. Please state salary offered in first letter. Box 5812, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACE Worker desires situation. 16 years in London. Experience in wholesale and retail. Well up in all glass work. Good knowledge of glazing and drilling. Able to take charge. Box 5813, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG LADY, age 17, seeks re-engagement in optical wholesale firm, experience in looking-out and despatching orders, 2 years' reference. Box 5806, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A., 22, wants permanent situation with good class firm. Five years' experience as refractionist. Box 5818, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED Situation as first-class all-round gold worker and jobber. Address, E.A. 11, Spencer Road, New Southgate, N.

EXPERIENCED Refractionist and keen business man desires post as branch manager or first assistant. Age 30, tall, passed part B.O.A. Apply, "Optics," 24, High Street, Hastings.

WORKING JEWELLER, age 30, studying optics, would like situation with optician, in Manchester or district. Well up in repairs. Apply, A. Gough, 26, Scarisbrick Road, Levenshulme, Manchester.

YOUNG MAN, age 25, requires situation in wholesale warehouse or stockrooms. 4½ years' experience. Box 5814, c/o "The Optician," 125, Fleet Street, E.C.4.

CAPABLE MAN, with good experience in wholesale and jobbing. Understands all about prescription work, both warehouse and workshop. Has also wide experience in retail as refractionist and handling of scientific instruments and general optical goods. Would take management or consider partnership in good firm. Highest references. Box 5815, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION of trust wanted by capable organiser with good all-round experience in wholesale and retail trade. Accustomed to management. Expert prescription hand and stock buyer, also capable refractionist and salesman. Wholesale or retail. Box 5816, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG LADY, F.S.M.C., desires position as optician's assistant. London wholesale, Provincial retail experience. Keen and willing. Excellent references. Box 5824, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST wanted temporarily from February 1st next. Write Box 5825, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG LADY requires situation, clerk or receptionist, Liverpool district, 5 years' experience with leading firm. Clarke, 44, Northbrook Street, Liverpool.

YOUNG Man, 18, seeks situation as stockroom assistant. No experience. Box 5800, c/o "The Optician," 125, Fleet Street, E.C.4.

LADY desires post as clerk, 5 years' general office experience,, quick at figures, typing. Good references. Box 5778, c/o "The Optician," 125, Fleet Street, E.C.4.

Concluded on page 6.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Bi-Lictic

Reg^d.

IS THE

BI-FOCAL LENS

ARE YOU PUSHING IT AND THUS GIVING SATISFACTION?

UNITED KINGDOM OPTICAL CO., LTD.,

(Wholesale and Export Only.)

MILL HILL, LONDON, N.W.7

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE OPTICIAN
Reg. at G.P.O. as a Newspaper

AMERICAN·OPTICAL·COMPANY, LIMITED

PRECISION



Your reputation depends upon the correctness of your examinations as much as any other part of your service. In fact, unless your diagnosis is accurate, all of your work is for naught. No matter how careful and skilful you are, unless your trial set is accurate, your examination is not reliable.

There is a way to insure every examination—make it with a Wellsworth Trial Set. Every lens in Wellsworth Trial Sets is minutely inspected, and must coincide exactly with the master set that has been certified as to focus. It is your guarantee that your work is mechanically correct.

Your Wholsaler can supply you with Information and Prices.

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C. 4. (Printed by The Century Press, Fulham), Jan. 20, 1922.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT-MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1609 FRIDAY, JAN. 27, 1922.

WELLSWORTH FITS-U WINDSOR EYEGLASSES.



THE FIRST THING—

that people require of Glasses is good looks. Sometimes it is called distinction of appearance, sometimes attractiveness, sometimes simply beauty. But whatever it is called the Fits-U Windsor has it

The Wellsworth Windsor construction is protected by British Letters Patent. Beware of infringements.

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

AMERICAN OPTICAL COMPANY, LIMITED,

39, Hatton Garden, LONDON, E.C.1

Reg'd at the G.P.O. as a newspaper **PRICE 4d** *Subscription post free 12 months 17s*

Postage in United Kingdom 1d

Digitized by Google Original from THE OHIO STATE UNIVERSITY

THE

PATENT L. W. ORTHOPS 167902.



THE L-W ORTHOPS OPHTHALMOSCOPE

This new instrument is entirely reflecting and eliminates most of the difficulties of ordinary ophthalmoscopy; with the minimum of practice, an excellent view of the fundus is obtained.

The instrument is worked by an ordinary small dry cell battery, measuring $3\frac{1}{4}'' \times 3''$.

It is an instrument that should be possessed by every sight testing optician who wishes to make ophthalmoscope examinations.

It can be obtained from any Wholesale Optical House, from whom a fully descriptive pamphlet can be had on application.

Manufactured by **GEORGE CULVER, Ltd., London, N.1**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

W.H.T.

WHY not place your requirements with the Firm who will satisfy your wants, and give you that necessary detail in all its directions.

HAVING made a study for many years, our knowledge and experience is at your service.

THEREFORE you can confidently expect all your commands executed to justify our claims.

We have OPTICAL SUPPLIES of every description and a PRESCRIPTION DEPARTMENT ready for all demands.

WALTER H. THOMPSON

66 HATTON GARDEN, LONDON, E.C. 1.

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

ANNOUNCEMENTS.

BIRMINGHAM BRANCH.

The title of WALTER BRAHAM & Co., Ltd., has been changed to **J. & R. FLEMING (Birmingham), Ltd.**

The constitution and management of the Company remain as before.

The best Equipment in the Midlands for high-class Prescription Work.

CARDIFF BRANCH.

Our Cardiff branch has been removed from 37, WESTGATE STREET, to more suitable and commodious premises at

13a, CUSTOM HOUSE STREET,

Telephone—Cardiff 743.

Complete Equipment for all kinds of Prescription Work.

J. & R. FLEMING LTD.,

Telephone:
HOLBORN {814 / 815
HOLBORN {2788 / 2789} Prescription Dept.

136-148 Clerkenwell Road,

LONDON, E.C. 1.

Telegrams:
"OTTICO." LONDON.

Branches with Prescription equipment:

J. & R. FLEMING (Brgm.), Ltd.
8, Key Hill Drive,
BIRMINGHAM.
Phone: Central 2509
Telegrams: "Brahma."

13a, CUSTOM HOUSE ST.,
CARDIFF.
Phone: Cardiff 743
Telegrams: "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1085.
Telegrams: "Ottico."

8, SHUDEHILL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master
The Rt. Hon. VISCOUNT HILL, L.C.C.

Upper Warden
CHARLES E. SEBAG-MONTEFIORE, Esq.

Renter Warden
HARRY HYLTON-FOSTER. Esq., Past Master.

Director of Examinations
The Rt. Hon. Sir WILLIAM HART-DYKE, Bt., M.A. Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C. 4

Official Instructor
Mr. LIONEL LAURANCE,
Director of THE SCHOOL OF OPTICS, Ltd.
2, GUILFORD PLACE, W.C. 1

The NEXT EXAMINATIONS of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in May, 1922.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,609

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, JAN. 27, 1922.

Scientific Handbooks.—With further reference to a matter raised by correspondents in our last two issues, our attention is drawn by Messrs. Longmans Green & Co., to their publications "Optical Projection," a treatise on the use of the lantern in exhibition and scientific demonstration by the late Mr. Lewis Wright, re-written and brought up to date by Mr. Russell S. Wright, M.I.E.E.; "The Methods of Glass Blowing," dealing with glass and silica working in connection with chemical and physical appliances, by Mr. W. A. Shenstone, F.R.S.,; and "Laboratory Arts," dealing with materials and tools used in the construction, adjustment and repair of scientific instruments by Mr. George H. Woollatt, Ph.D. The first-mentioned book was reviewed in our issue of June 18th, 1920; and we consider it an invaluable handbook on the subjects discussed. Messrs. Simpkin, Marshall, Hamilton, Kent & Co. draw attention to Heather's "Surveying and Astronomical Instruments," and "Mathematical Instruments: Their Construction, Adjustment, etc." We may further mention Whittaker's "Theory of Optical Instruments," Orford's "Modern Optical Instruments," Martin's "Lectures on Compass Adjustment," Messum's "Hydrographic Surveying," Waldo's "Modern Meteorology," Adams' "Practical Surveying." There are a number of other books on the use of surveying and meteorological instruments; but none the less, it seems impossible to meet

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

fully the needs which have been mentioned in our columns from the English bookmarket. We will be pleased to publish any other references that may be sent us.

* * *

To Correspondents Whom It May Concern.—Both a troublesome and a thankless task is the deletion from letters sent for publication in this paper of matter to which we cannot stretch the utmost limits of reasonable "freedom of the Press." We object to and exclude what is "objectionable"; but that does not in the least imply that facts or opinions, however unpopular or unpleasing they may be, which are of general trade interest, are ever denied publicity. The trade journal, having no party politics to promote, gives freer scope to the exploitation of rival propaganda than is at all usual in newspapers of another class. Correspondents may say what they like about one another within reason (provided the law of libel is not infringed). Statements of opinion or of fact attributed to any third party cannot be admitted however, if there is any likelihood of causing offence. Such statements are often made in advertisements, and they can be published in our own advertising columns, subject to our right to require documentary or other proof of them. In particular with respect to matters attributed to persons deceased, we would subscribe to the journalistic motto, "When in doubt leave out." The remarks here made do not apply specially to a letter from Mr. Braham which we publish in part this week, though they do so to some extent. Many attempts are made to embody in our correspondence columns matter which should appear in the advertising pages or not at all. And we can fairly claim that we give every reasonable latitude; for we know well that, however widely they may be objected to, new views expressed in the correspondence columns of a newspaper command the attention of all classes of readers.

The National Association of Opticians.

A meeting of the Council of this body was held at the Carlton Hall, Eberle Street, Liverpool, on Wednesday, the 18th inst. There were present Mr. Hershberg in the chair, Messrs. Adams, Beardsall, Green, Jones, Moevius, Oberle, and the Secretary. Apologies for absence were received from Messrs. Chalmers, Baird and Daykin.

The President, referring to this being the first meeting in 1922, took the opportunity of wishing the Council a very Happy and Prosperous New Year. He stated that to-day, officially, Mr. Parry took up the work of Secretary of the Association, and although he was by no means a stranger, this was his first meeting in his official capacity, and he felt sure he was voicing the feelings of the Council in wishing him success in the work he had undertaken. Mr. Parry had taken up this duty, not from lack of work, but from a desire to be of help to the Association. The President expressed his confidence in and appreciation of the new Secretary, feeling sure his acceptance of the office would be of immense value to the Association.

The following were elected Members of the Association:—Messrs. H. Ellingham, London; T. Johnson, North Shields; W. J. Swithenbank, Enfield, W.; C. Horsburgh, Paisley; G. F. S. Blagrave, Newport; T. Clatworthy, Ystalyfera; H. B. Phillips, Neath; A. Swanston, Bradford; J. H. Smith, Lincoln; G. R. Lawrence, Rhyl; R. Clifford, Bourton; A. Goodman, London; J. T. Mountain, Bicester; R. W. Swallow, Wolverhampton; F. J. Swinfen, Tottenham; D. R. Grey, Gorleston-on-Sea; G. J. Metcalfe, Newport; P. A. Gibney, Dublin; O. Price, Maidenhead; E. Thomas, Leicester; C. H. Grad, Finsbury Park; M. Levy, Stamford Hill; E. Webb, Gillingham; and L. Cartwright, Preston. Several applications were referred back.

A discussion took place with reference to the admission as members of wholesalers actually carrying on business as such. It was felt that the National Association of Opticians was primarily intended to advance the interests of the practising sight-testing optician, and that no advantage could be gained by the admission of wholesalers, except by way of examination.

The Secretary reported that four members had resigned.

A report of the postcard vote on the panel service was submitted, a large majority being in favour of accepting the terms of the National Insurance Beneficent Society.

The future policy of the Council was considered at length, and points of agreement arrived at. It was decided to engage a chartered accountant to examine the books; and a resolution limiting the election of members under present conditions until July next, was rescinded. It was agreed the examination scheme shall come into force in July, and a special Committee, consisting of Messrs. Hershberg, Beardsall, Jones, Moevius and Oberle, were appointed, with full powers to act in all matters concerning the syllabus, etc.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Note on the Thin Astigmatic Lens.*

By T. W. CHAUNDY, M.A., Christ Church, Oxford.

There is a result in the first approximation theory of a thin astigmatic lens which does not seem to be so widely known, as, I think, it should be. Essentially it may be stated as follows: An aspherical wave-front is refracted normally at an aspherical surface. If $1/r$, $1/s$ are the principal curvatures of the incident wave-front, their planes making angles α and $90^\circ + \alpha$ with a chosen reference-plane; if

$$1/R,\ 1/S,\ \theta,\ 90^\circ + \theta$$

are similar quantities for the refracting surface, and

$$1/r',\ 1/s',\ \alpha',\ 90^\circ + \alpha'$$

similar quantities for the emergent wave-front; then

$$u = 1/r + 1/s,\ u = (1/r - 1/s)\cos 2\alpha,\ u = (1/r - 1/s)\sin 2\alpha$$

all satisfy the Gaussian formula

$$\mu' u' - \mu u = (\mu' - \mu)\mathrm{U}.$$

To establish this I need the analytical expression of the fundamental laws of refraction, viz.,

$$\left.\begin{aligned} \mu' l' &= \mu l + \kappa \mathrm{L} \\ \mu' m' &= \mu m + \kappa \mathrm{M} \\ \mu' n' &= \mu n + \kappa \mathrm{N} \end{aligned}\right\} \quad \ldots \quad (1).$$

Here (l, m, n) and (l', m', n') are the direction cosines of the incident and emergent rays, (L, M, N), those of the normal to the refracting surface and κ a quantity whose evaluation does not here concern us.

Now for normal refraction I may take the origin of three dimensional Cartesian co-ordinates as point of incidence and the x-axis as common normal. We may thus take the equation to the incident wave-front, the refracting surface and the emergent wave-front to be

$$2x = ay^2 + 2hyz + bz^2 \quad \ldots \quad \ldots \quad (2)$$
$$2x = \mathrm{A}y^2 + 2\mathrm{H}yz + \mathrm{B}z^2 \quad \ldots \quad \ldots \quad (3)$$
$$2x = a'y^2 + 2h'yz + b'z^2 \quad \ldots \quad \ldots \quad (4)$$

Consider a point (x, y, z) of the incident wave-front near the origin, *i.e.*, y, z are small quantities of the first order and x—from equation (2)—small of the second order. The normal at (x, y, z) to (2) has direction cosines proportional to

$$1, -(ay + hz), -(hy + bz).$$

Since the sum of the squares of these quantities differs from unity by a small quantity of the second order, we may regard them as *actual* direction cosines. Any point on this normal has co-ordinates

$$x + \lambda,\ y - \lambda(ay + hz),\ z - \lambda(hy + bz)$$

where λ is some parameter. This cuts (3) where

$$2x + 2\lambda = \mathrm{A}y^2 + 2\mathrm{H}yz + \mathrm{B}z^2 + \text{quantities of higher order.}$$

Hence λ is of the second order, and to a first approximation the point of incidence on (3) is

$$(x + \lambda, y, z).$$

The normal of refraction has therefore direction cosines

$$1, -(\mathrm{A}y + \mathrm{H}z), -(\mathrm{H}y + \mathrm{B}z),$$

and the emergent ray has direction cosines

$$1, -(a'y + h'z), -(h'y + b'z).$$

Hence by equation (1)

$$\mu' = \mu + \kappa,$$
$$\mu'(a'y + h'z) = \mu(ay + hz) + \kappa(\mathrm{A}y + \mathrm{H}z),$$
$$\mu'(h'y + b'z) = \mu(hy + bz) + \kappa(\mathrm{H}y + \mathrm{B}z),$$

These equations are true for all small values of y, z, if (1) truly represents the emergent wave-front. Hence we may replace them by

$$\left.\begin{aligned} \mu' a' &= \mu a + (\mu' - \mu)\mathrm{A} \\ \mu' h' &= \mu h + (\mu' - \mu)\mathrm{H} \\ \mu' b' &= \mu b + (\mu' - \mu)\mathrm{B} \end{aligned}\right\} \quad \ldots \quad (5).$$

Now, since the principal curvatures of (2) are $1/r$, $1/s$ lying in planes making with yOx, say, angles α, $90^\circ + \alpha$, its equation may be rewritten

$$2x = (y\cos\alpha + z\sin\alpha)^2/r + (y\sin\alpha - z\cos\alpha)^2/s,$$

so that

$$a = \cos^2\alpha/r + \sin^2\alpha/s,$$
$$h = \sin\alpha\cos\alpha\,(1/r - 1/s),$$
$$b = \sin^2\alpha/r - \cos^2\alpha/s.$$

Hence

$$a + b = 1/r + 1/s,$$
$$a - b = (1/r - 1/s)\cos 2\alpha,$$
$$2h = (1/r - 1/s)\sin 2\alpha,$$

* Paper communicated to the Optical Society.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

and similarly for the other surfaces.

Substitution in equation (5) gives the promised result,

$$\mu'(1/r'+1/s')=\mu(1/r+1/s)+(\mu'-\mu)(1/R+1/S) \quad \ldots \quad (6),$$

$$\mu'(1/r'-1/s')\cos 2\alpha'=\mu(1/r-1/s)\cos 2\alpha+(\mu'-\mu)(1/R-1/S)\cos 2\theta \quad (7),$$

$$\mu'(1/r'-1/s')\sin 2\alpha'=\mu(1/r-1/s)\sin 2\alpha+(\mu'-\mu)(1/R'-1/S')\sin 2\theta \quad (8).$$

We may replace equations (7) and (8) by the simple complex equation (using i for $\sqrt{-1}$)

$$\mu'(1/r'-1/s')e^{2i\alpha'}=\mu(1/r-1/s)e^{2i\alpha}+(\mu'-\mu)(1/R-1/S)e^{2i\theta} \quad (9).$$

Equation (6) which shows that the mean curvature obeys the Gaussian formula is generally known, I believe. But I have no references to the corresponding property of what we may call the "components of curvature-difference," as represented by equations (7), (8). These equations represent, in point of fact, a vector-addition. That is to say, if we draw in a plane a length AB proportional to $\mu(1/r-1/s)$ and in a direction 2α, and then a length BC proportional to $(\mu'-\mu)(1/R-1/S)$ and in a direction 2θ, then AC is proportional to $\mu'(1/r'-1/s')$, and is in a direction $2\alpha'$.

Finally, if we have a succession of normal refractions, occurring effectively at the same point—*e.g.*, as occasioned by passage through a *thin* astigmatic lens or by a series of such lenses in close contact—then equations of the types of (6), (7), (8) are applicable to each refraction and in full analogy with Gauss's results we see that the "mean powers" and the "components of power-difference" of the constituent surfaces are additive to give the "mean power" and the "components of power-difference" of the complete system.

Some Points in Handling Cases of Presbyopia and Subnormal Accommodation.*

Lecture given before the Scottish Society of Ophthalmic Opticians by Dr. CHARLES SHEARD, Ph.D., Sc.D., Division of Ocular Interests of the American Optical Company, Southbridge, Mass., U.S.A.

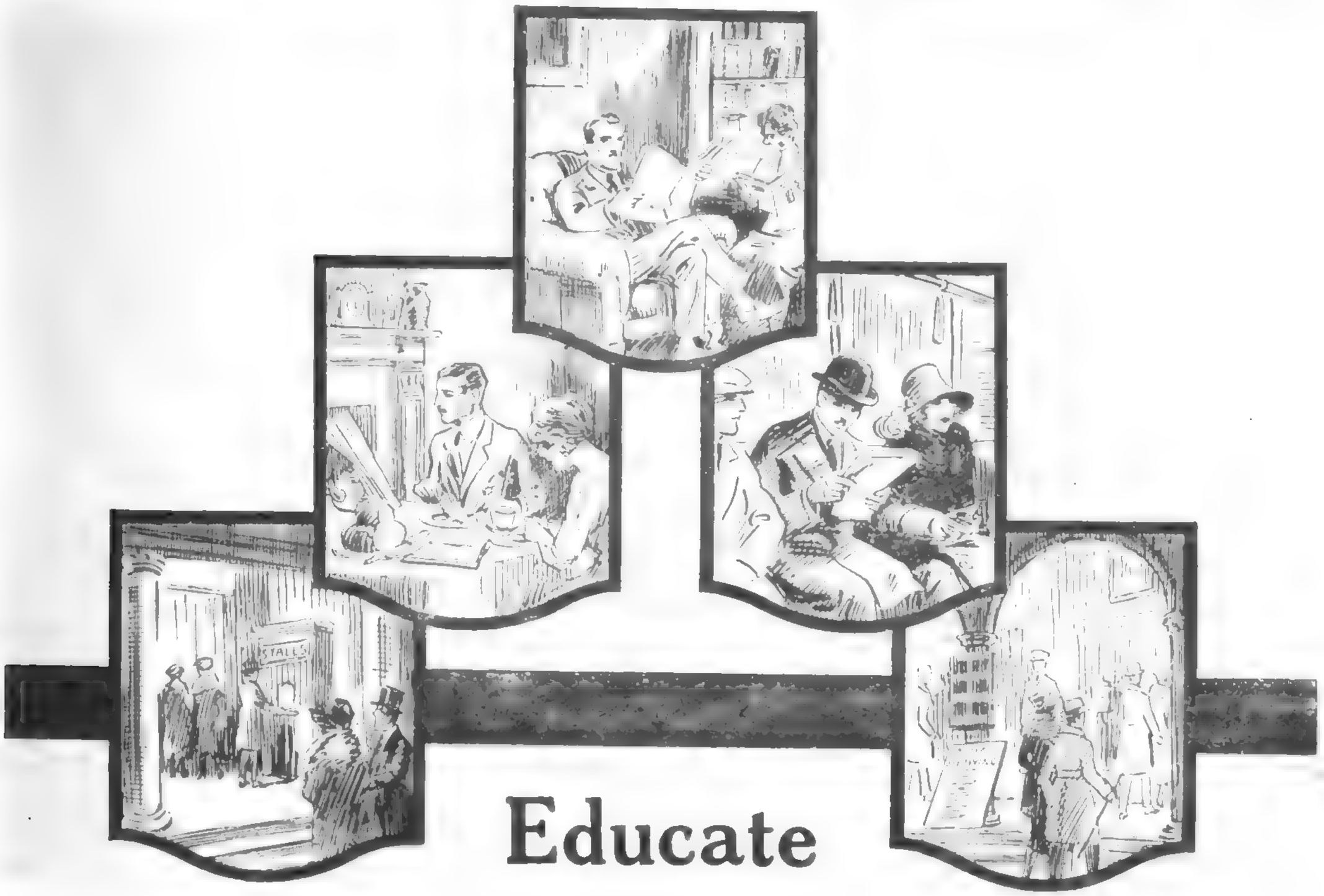
And further, as our eighth point, we do not believe that there is ordinarily any reason for adding more than +3 D.S. as the limiting value, even in cases where the near-point is 13 inches, as a reading correction in presbyopic cases. When we hear of +4 D.S. or amounts approximating this as additions for reading in presbyopic cases we suspect one of two possibilities; either (1) the static error has not been properly corrected either through negligence on the part of the examiner or possible inability to cause full findings to be accepted with comfort or, (2), in conditions of lowered acuity the higher reading corrections may be of service as magnifiers, giving large form to letters although leaving them with less distinct outlines. We do not believe that the first reason given is in general a valid one as the final outcome of a case, but may possibly have to be resorted to in rare cases in initial corrections. There is the possibility that the second reason assigned may be of real value in an occasional case. We have to say that we look with suspicion upon any set of findings in which the reading addition for the customary reading distance of 12 or 13 inches is greater than **3 D.S.**

In the ninth place, we must point out the fact that, while we have just urged the point that distance corrections in presbyopic cases are too often only partial corrections, considerable care must be exercised in distance fittings of presbyopia to insure the removal of that slight fog or haze at distance so often complained of, where in our offices we find the acuity through such glasses to be nearly 20/20 or slightly better. The common complaint is that people are readily distinguished at 10 feet but not at 20 feet or even 30 feet; the preacher at church, the distant scenery, or what not, are not just as clear as desired. Of course, it is possible that such exactness is not obtainable in many presbyopes due to changes which come with years. But when our clinical tests show V=1 or slightly better we may be assured that such complaints are genuine. A moment's reflection will lead to a solution of this matter, for 20 feet is not infinity but is represented by a dioptric value of 0.16 D.S. This is close to the quarter-diopter spheres of our trial case contents.

We feel that the procedure should be to carefully determine full corrections giving

*Concluded from page 331.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



Educate

Nothing new for the good of people ever sprang into fame in a night.

It takes time for new ideas to win their proper proportion of popularity.

But don't let time bear all the burden of making **Chance's 'Crookes' Glass** thoroughly known in your locality. Use publicity.

We will supply you free with excellent advertising matter for use in your local press and places of entertainment and in your windows, if you will kindly communicate with us.

CHANCE BROS., & Co., Ltd.,

Glass Works,

SMETHWICK, BIRMINGHAM.



The late Sir Wm. Crookes, O.M., F.R.S., to whose researches was largely due the evolution of Chance's "Crookes" Glass.

Chance's 'CROOKES Glass

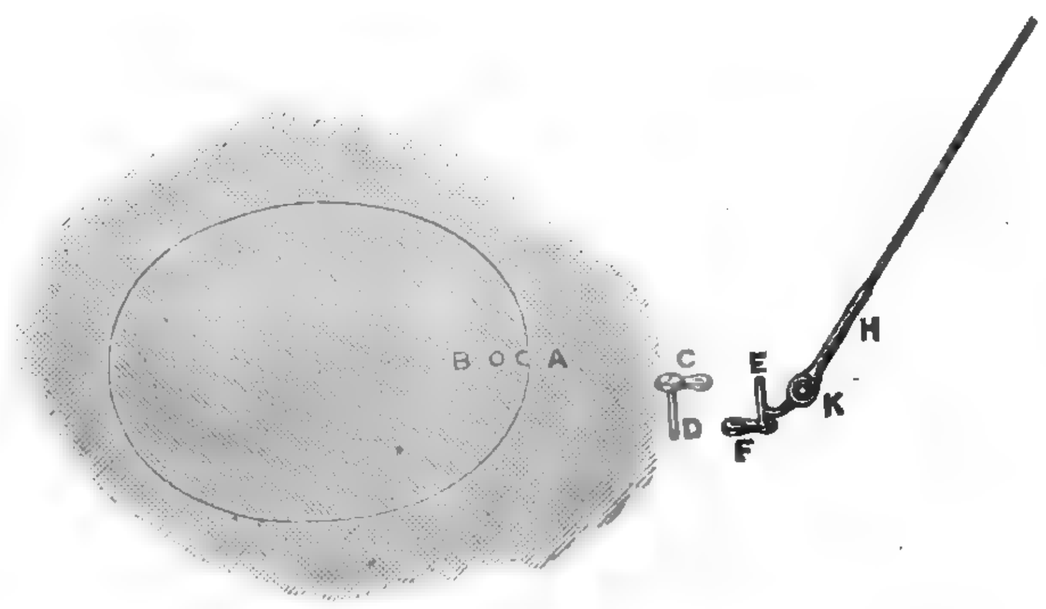
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Phone:—City 3225 (3 lines) ***Telegrams:—Bulford, BARB. London.***

PATENT **"INVISO"** REG. MOUNTINGS

THE Patent **"Inviso"** method of attaching the mountings to the lenses lends itself to extreme lightness. This makes itself apparent in a marked degree in Spectacle mountings, since it obviates the placing of a bearing part of metal against the edges on the lenses, as in the regular form of fitting.



A—Slot in Lens. B—Hole in Lens. C—Loose Strap sliding on E.
D— Screw passing through Lens in fixed Strap F. K—Joint. H—Cable Curlside.

In illustration of lens it will be noted that a narrow slot A, is made in the lens parallel with the hole B, into which the fitted E sinks (Pat. No. 21944). Our patent No. 14838 also provides for a movable strap C so that the lenses of different thickness can be fitted. This in itself is a great advantage over the regular mounts, which being rigid cannot be fitted with the accurate precision which is so necessary when dealing with lenses of so many different thicknesses, which so often, are between the regular sizes made. The **"Inviso"** loose strap overcomes this and moreover a contact fit is made in all cases. The illustrations show the lightness and neat appearance over the regular form in use.

Made by the firm whose Reputation for Prescription Work is:—*"Second to None."*

NEWBOLD & BULFORD, ***Prescription House,***
GOSWELL ROAD, LONDON
E.C.1

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

V=1 and to then undercorrect each eye for distance by O.U. 0.25 D.S. Another easy and valuable test, where possible, is to have the patient look for detail in some fairly distinct object with full corrections and when reduced by a quarter diopter. When an appreciable difference exists in keenness of vision, the response will be rapid and most assuring.

Astigmatism Against the Rule.

As a tenth point, we are calling attention to the care and judgment needed in the matter of the incorporation of corrections for what is commonly called astigmatism against the rule in presbyopic cases. It is a fairly well-known fact in physiological optics that as a general rule a condition of no astigmatism in early years gives way to an inverse or against-the-rule astigmatism or again a small amount of with-the-rule-astigmatism may disappear or even become inverse in its character. We believe it is very desirable from the standpoint of comfort and general satisfaction to presbyopes that against-the-rule astigmatism be under-corrected and in low amounts—quarter diopters—be omitted in general.

There are those I am sure who will disagree with this suggestion but our experience is in the form of the proposition as we have presented it. As a general matter of optical practice reading glasses are angled with respect to the eyes and this angling introduces in reasonably large presbyopic corrections a cylindrical effect to serve as a correction of low astigmia against the rule. Furthermore, looking obliquely through a lens and the use of the pheripheral portions or parts of the lens remote from the centre will introduce a cylindrical effect. We have seen, for instance, cases in which findings from every scientific procedure indicated +1.00 cyl. ax. 180 in conjunction with the spherical findings. If such correcting lenses are made up, it is our experience that they will alway be annoying and will be a source of complaint, which can be remedied by the reduction of the cylindrical power to +0.50 D. cylinders.

It will be apparent from the arguments which have been presented that we are not arguing for the replacement of good scientific findings with arbitrary changes, for the reason that the laws of physical optics indicate to us that certain conditions present in presbyopic corrections afford cylindrical effects offsetting a certain amount of astigmatism against the rule. We may also be permitted the citing of the inadvisability of giving a cylindrical correction of low amount, especially in presbyopic corrections, when such is found to exist in one eye only.

We pass on to consider the indications of the early stages of presbyopia or need for additional assistance in doing close work. We shall bar out from the discussion cases which may be properly classed as abnormal subnormal accommodation as distinct from natural or normal insufficiency of accommodation. The remarks which follow, however, are in general applicable to all conditions of such insufficiency.

As the eleventh consideration, therefore, we may point out the quite frequent occurrence of that which we have designated as overconvergence as associated with the act of accommodation. In other words, when the accommodation is active in the process, for example, of reading, and the act of fusion is annulled, tests often show an accommodative overconvergence, whereas muscle tests at distance show a slight divergent or exophoric condition. Such a condition can arise from excessive innervation to the ciliary to produce the actual accommodation physically and physiologically demanded and such tests may, therefore, be an important clue to the necessity for additional reading corrections. The giving of additional half or one diopter spheres in such cases will often show an immediate reduction in the overconvergence, this indicating that a better innervational condition has been established both from convergence and accommodative standpoints. Near muscle tests may, therefore, be very valuable in aiding us in our judgments as to proper procedure.

Ability to Sustain Accommodation.

In the twelfth place, the test as to the ability to sustain accommodation is a most useful criterion in our handling of cases of suspected presbyopia. We objected earlier in our deliberations to following any arbitrary rule such as one which stated that the presbyopic state existed if the near-point was not equal to or less than eight inches. The ability to sustain accommodation is a much more instructive and valuable test. We have often had pairs of eyes, which demonstrated their ability to read fine print or better still, distinguish detail at eight inches or less, but which could not maintain any such standard. To my mind the procedure of finding the maximum amount of pull which any muscle can exert momentarily is a poor criterion of its ability to carry on work demanding the expenditure of considerable energy over a continuous period of time. As we view it, a test of my ability to register

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

on a scale my limit of pull is no criterion as to my endurance. One pull may be indicative of ample strength only to be negatived by subsequent loss registers under repeated trial. Many eyes will show such performances as to their ability to sustain accommodation.

Rapid Diminution of Amplitude.

We have seen pairs of eyes which, under initial test, showed a maximum amplitude of accommodation of five diopters, but which, if you please, "petered out" very quickly and gave constantly decreasing amplitudes of accommodation under very few trials. For example, a pair of eyes reading fine print at 13 inches, may initially overcome +2.5 D.S., indicating a total of five and a half diopters of accommodation. The limit having been reached the accommodation may be relaxed and everything become blurred. Repeated trials showed that −2 D.S. and then −1.5 D.S. can be overcome, possibly, concluding with evidence indicating an ability to sustain an accommodative act involving four or four and a half diopters. Such a test indicates the need of accommodative assistance in order that close-work may be carried on efficiently and with comfort, whereas a single near-point test would lead to the conclusion that no such assistance was needed. The distance at which the accommodative act may be readily sustained is a better criterion than is the determination of the distance indicating maximum amplitude of accommodation.

As a further consideration—and thirteenth in point of order—we desire to call attention to the doctrine which appears to have received wide acceptance, in America at least, that in hyperopia with exophoric tendencies there should be, in general, a reduction to the correcting spheres and that in hyperopia with esophoria there should be correspondingly an increase or as full a correction as possible. Presbyopia, although due to depleted accommodation at the near point of work in contradistinction to abnormal or excessive drain upon the accommodative resources because of a hyperopic error of refraction, may, by virtue of the fact that convex lenses are demanded as corrective agents, be classed as a form of hyperopia. Hence the general statement just recorded with reference to cases of hyperopia is also made applicable to presbyopic conditions.

We are in accord in both the general conditions of hyperopia and presbyopia with the doctrine that full corrections should be given in such cases when esophoric tendencies are found, provided these esophoric tendencies persist also in the near tests. On the other hand, we are in disagreement with the doctrine of the reduction of hyperopic or presbyopic corrections, *per se*, when exophoria exists either at distant or near points. Quite commonly, tests upon exophoria and esophoria are made at distance, *i.e.*, 20 feet, and the notion seems to be that a full correction or even over-crowding of hyperopic corrections should occur when esophoria is present in order that the heterophoric tendency may be allayed through suppression of the accommodation and that, on the other hand, an under-correction should be given when exophoric tendencies are discovered in order that orthophoria or stimulation thereto may exist through allowing some accommodative action to persist. But the fallacy in the second part of this teaching we believe lies in the fact that each pair of eyes is a law unto itself and that specific tests alone, as performed with and without hyperopic corrections, will evidence the existence of any correlation between the heterophoric condition and the accommodative demands.

For example, we have seen many cases in which O.U. +1.50 D.S. afforded (binocularly) V=20/20. When the tonic conditions at distance were investigated both *with* and *without* correcting lenses in turn such a condition as 3° exophoria might exist. In such cases, it is quite evident that there is an inherent exophoria and that the same is not corrected by and has no connection with convergence associated with accommodation. And again, cases arise in which O.U. +1.50 D.S. give (binocularly) V=20/20, and which show no imbalance at distance without correcting lenses and possibly evidence 3° exophoria with full correcting lenses, showing conclusively that an inherent exophoria is corrected or taken care of in such cases through the convergence associated with accommodation.

Factors in Convergence.

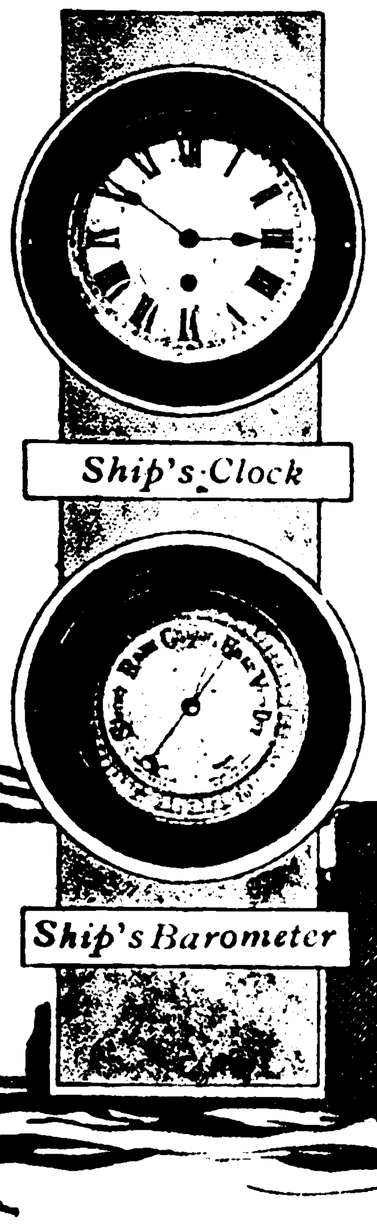
A little consideration of these two sets of conditions, identical as to refractive error, as well as many others which arise in practice ought to convince us of the fact that the convergence necessary for binocular single vision at any point is not necessarily derived wholly through the act of accommodation, *i.e.*, in accompaniment with this act and therefore to be designated as *accommodative* convergence, but that the *fusion convergence*—under the control of the fusion centres—may be operative in many pairs of eyes to furnish the deficit as left by the accommodative convergence in order that binocular single vision may ensue at any fixation point specified. There are,

Digitized by Google Original from THE OHIO STATE UNIVERSITY

T. A. R. & Co.

"THE ALL BRITISH HOUSE."

Over 2,000 Designs in Aneroid Barometers.



Time and Tide
And Ship's Instruments



T.A.REYNOLDS & CO
40-1-2 PERCIVAL STREET,
LONDON E.C.1



Steam-pipe Thermometer *Hydrometer*

Telegrams—
"THERBAROME. LONDON."

Telephone—
339 CITY.

Showrooms and Offices at above address.

If you are a Retailer and need ORIGINAL LINES in Barometers, Clocks and Thermometers, write us, and although we will not supply you direct, we will put you in touch with the Nearest Wholesale House.

WHOLESALE AND SHIPPING TRADE ONLY.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

What builds up your Rx turnover if not the character of your service and the quality of the eyeglasses you supply?

Your training and experience enable you correctly to diagnose eye-defects and prescribe properly adjusted glasses. This ability is naturally the corner-stone in the structure of your business.

But hardly less important is the accurate interpretation of your Prescriptions. Indeed, without full and absolute confidence in the firm handling this part of your work, your personal skill is likely to be nullified entirely.

Your can place complete trust in the L.O.C. Service.

As far as human foresight, technical skill, and mechanical facilities can ensure it, we have provided against every untoward emergency likely to impair our customers' interests.

Telephone: MUSEUM 4572

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris. France.

Also at—2, Str-Bursei, Bucharest, Roumania.

Telegrams: Locoptical Kincross London.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

therefore, many cases in which O.U. +2.50 D.S., for example, are apparently satisfactory as a reading correction—affording a sufficient reading amplitude and range with the best seeing region at about the customary reading point—and in which distance tests without distance corrections (if any exist) show a degree or two of exophoria or possibly orthophoria, but which, on the other hand, show high degrees of exophoria—eight, ten or twelve prism diopters for example—when such tests are conducted at the reading point.

Binocular Fixation.

Simple tests quickly demonstrate whether or not binocular vision through O.U. +2.50 exists at the reading point. If such vision does exist we are cognizant of the fact that binocular single vision in such cases as we are discussing was not central, *i.e.*, in accompaniment with or through the acts of accommodation and that the deficit in order that binocular single vision might exist was supplied through the positive fusion centres.

And yet again, another pair of eyes may be under simultaneous observation and requiring O.U. +2.50 D.S. for reading purposes, in which tests will show either the full complement of convergence, necessary for binocular single vision, associated with the accommodative act or there may occasionally be a condition of over-convergence evidenced under dissociation tests.

In concluding our comments on this point, it seems to us that many of the notions current upon the dependence and interdependence of accommodation and convergence need revision and that, to say the least, conditions of muscular imbalance at distance should have, *per se*, no weight in matters of modifying presbyopic corrections. The only scientific basis we believe is that which rests upon *data obtained upon the function or functions involved at the point for which fixation and accommodation are undertaken.* For the condition of dependence, in whole or part, and of independence, in whole or in part, of the functions of accommodation and convergence are as characteristic of a pair of eyes as our own facial features are characteristic of each of us individually. And if the convergence necessary for binocular single vision were obtainable only in accompaniment with the specific act of accommodation and as a necessary normal consequence of the act of accommodation *per se*, there would then be a solid basis for the doctrine of reduction of presbyopic and hyperopic corrections in conditions evidencing exophoria.

But the convergence act with reference to any point of fixation may be accomplished through two functions, namely, accommodative and fusional innervations. As to the proportion of innervation furnished from each set of centres or by each source, we cannot guess but we can easily test and determine. One simple test consists in suspending *fusion* through the use of vertically dissociating prisms and permitting the act of accommodation to take place for any desired distance through the viewing of a dot or a line of letters. Doubleness of images of test object used will accrue under this test and the amount of prism needed to align the dots gives a measure of the convergence deficit or excess (as the case may be) in association with the innervational deliverances to accommodation.

Rules Approximate Only.

In conclusion, as our fifteenth consideration, we desire to call attention to the fact that any arbitrary rule as to the amount of accommodative amplitude which should be left in reserve in any case of presbyopia is, in the last analysis, of little value except as being an approximation. We have frequently met with statements in articles and text-books on this matter and the recommendation is either that one-half or two-thirds of the total amplitude be left in reserve. But surely it must be admitted that some pairs of eyes will need more and some less than any amount specified as a general proposition. We have already pointed out that such factors as fatigue and ability to sustain accommodation are most important in presbyopia as well as conditions of unnatural subnormal accommodation. We have conditions which are classified as painful accommodation and we often have accommodative difficulties of a characteristic type in neurasthenics or those who suffer from nervous derangements. We have, again, already pointed out the fact that a whipped and overtaxed accommodation, such as may exist in early stages of presbyopia or in abnormal subnormality of accommodation, may at times give rise to an overconvergence impulse because of the fact that the function of accommodation and convergence may be very intimately linked and very dependent upon each other, hence demanding a considerable amount of accommodative suppression and leaving more accommodation in reserve than ordinarily, whereas if such a condition of affairs did not exist we should proceed otherwise.

We know of no exact methods of procedure which can be recommended as giving us the

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

data which are desired on this point. The history of the case, symptoms and complaints, furnish valuable indications to direct our attention to these possibilities. Furthermore, methods of dynamic skiametry when practised with fixation and observation in the same plane and when lens quantities are added until neutral shadows are obtained, furnish us most valuable objective data. The test by dynamic skiametry quickly and reasonably accurately indicates the lenticular assistance needed in presbyopia or in subnormal accommodation.

And, finally, subnormal, paretic, insufficiency of accommodation or premature presbyopia, as some have desired to call it, and even paralysis of the accommodation of a functional or reflex nature and not dependent upon organic disease *per se*, exist in a considerable number of young and those approaching the close of their mid-thirties. Time and space permit us only the comment that practitioners should make tests upon the accommodative demands and resources of every pair of eyes that comes under their observation and care, for age is no respecter of eyes any more than of other bodily organs and for the further reason that each pair of eyes is a law unto itself and is not amenable to any law of average treatment or correction, however true such dicta are in general.

Geometrical Ophthalmic Optics.—X.

By WILLIAM SWAINE, B.Sc.

Foreword.

The writer had written the last article and drafted out the following article in rough before seeing the report of Dr. Sheard's lecture recorded last week (p. 327). The lecture and the present article are so intimately related, whilst the views of Dr. Sheard coincide in great measure with those of the writer, that he suggests their being read concurrently. Dr. Sheard *states* the points which the writer is attempting to solve and to place the results of mathematical calculation *under the conditions of practice* with the 'elasticity' (p. 331) asked by Dr. Sheard. Up to the present I have used the term 'amplitude of accommodation,' not strictly as Donders used it, viz., the maximum amount, but the difference between the static and any dynamic ocular refraction. The terms 'accommodative resources and demands' suggested by Dr. Sheard are so descriptive that the writer intends to adopt them.

In the same connection it is remarkable that Mr. Whitwell's recent contributions centre around one of the troubles in spectacles and near vision, viz., false stereoscopic effects.

Vertex Powers.

The writer has suggested that unsymmetrical lenses be marked according to front and back vertex power or what is, in practice the same thing, neutralising lens and equivalent distance correction (*The Optician*, Oct. 8, 1920, p. 71, Dec. 21, 1920, p. 239).

Equation (34) in Art. V. (July 22, p. 311, 1921), states that,

$$\frac{\text{Back Vertex Power}}{\text{Front Vertex Power}} = \frac{V_{12}}{V_{21}} = \frac{1-\delta_1 D_2}{1-\delta_1 D_1} \text{ exactly}$$

$$= k \text{ (say)}$$

and since

$$V_{12} = \frac{D_1}{1-\delta_1 D_1} + D_2 \quad \ldots \quad \ldots \quad \ldots \quad (30)$$

it follows that $D_2 = \frac{V_{12}}{2} - \frac{(k-1)}{2\delta_1}$ (approx.)

The connection between the double designation marking and the present day base-curve marking is contained in this expression to within the 3 per cent. limit imposed by the Optical Society's Standards Committee Report. The relations are plotted in fig. 13, the values of δ_1 (reduced thickness of the lens) being assumed as in the following table:—

V_{12}	1	2	3	4	5	6	7	8	9	10
$\delta(+)$	.70	.93	1.15	1.37	1.58	1.79	2.00	2.21	2.41	2.61
$\delta(-)$	.67	.67	.67	.67	.67	.67	.67	.67	.67	.67

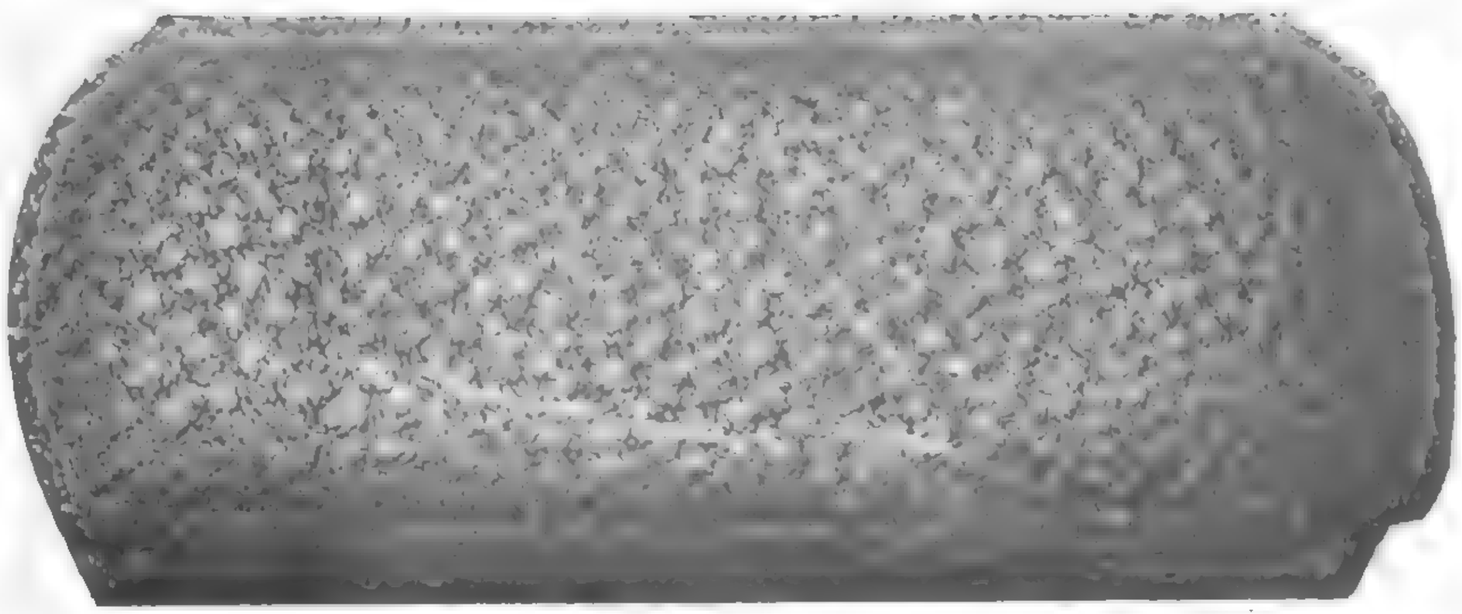
As with the Chart of Lens Forms (July 1, 1921, p. 266) ordinates are back vertex power, abscissae are the powers of the surface next to the eye. The Best Form lenses for distance and near are again plotted.

Thus for any form of lens described either

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"WERTEX"
WILLMOTTS'
LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.



11c 11c

Satisfy your client by selling him a specimen of your skill, and then gratify him by presenting him with a specimen of ours.

Use "WERTEX" Cases.

Details and samples from your dealer or direct from the manufacturers.

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

ENGLAND.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

DUPAUL, YOUNG OPTICAL CO'S

Guaranteed Quality 1/10th 12 carat

"TUBULAR"

Finger Piece Mounting & Finger Piece Frames

are still recognised as the

BEST ON THE MARKET.

Insist on getting

DYO

Finger Piece Mounting and Finger Piece Frames

and you will be sure to obtain

"TUBULAR"

and NOT Coil Spring and Washer construction goods.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

"BISHOP EYEGLASS CHAINS"

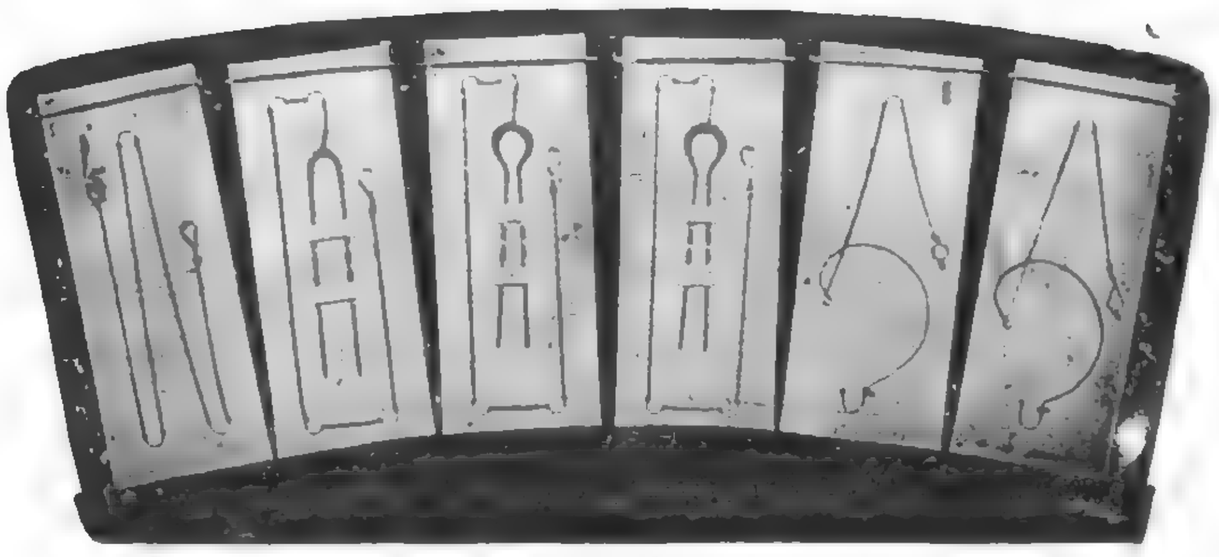
In Gold and Gold Filled

ALSO

SILK EYEGLASS & MONOCLE RIBBONS

are well known to the OPTICAL TRADE and have always been known to give satisfaction. Quality and Finish are evident in all goods of Bishop manufacture and the Bishop trade mark on all chain cards and boxes is your guarantee of absolutely dependancy.

Avoid substitutes, let "BISHOP CHAINS" be your standard of Quality.



THE BISHOP COMPANY,
North Attleboro, Mass.,
U.S.A.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE S. PULZER, 9, HATTON GARDEN, E.C.1

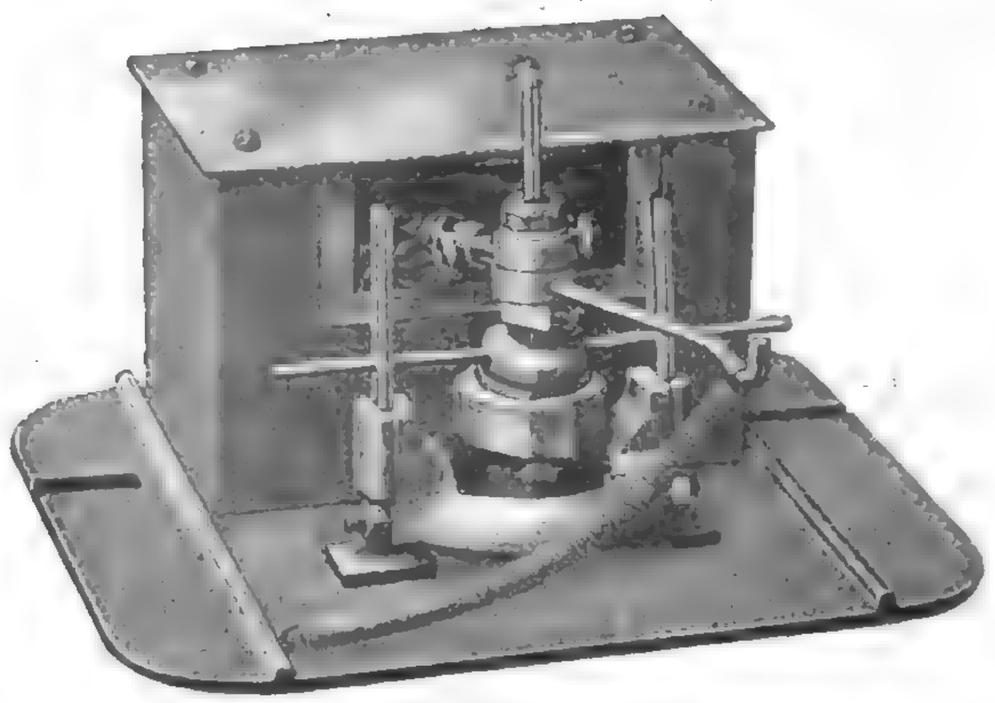
Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"SOMCO" Auto-Surfacing Machine.

British Industries FAIR, WHITE CITY, February 27th— March 10th. OUR STAND **E18**



The "SOMCO" Demonstrated in operation at OUR STAND **E18**

PLEASE NOTE CHANGE OF ADDRESS—

SURGICAL & OPTICAL MFG., Co.,

~~22, Union Road, Clapham. S.W.4~~

35, CHARLES STREET, HATTON GARDEN, E.C.1

Rx

SANDRO LOWY

Optical Rx Specialist,

88, Goswell Road,

LONDON, E.C. 1

Telephone: CITY 384 (two lines)

Telegrams: SANOPTIC, LONDON.

Rx

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

by base curve, component curves, etc., the relation between the vertex powers (k) may be obtained at a glance; or, the chart gives the neutralising lens once the base curve and V_{12} are known. The curve 1.03 means that the neutralising lens is 3 per cent. less than the trial correction.

Take for example a -6.0 base D.M. of back vertex power $+12.0$, for which the neutralising lens is (see Whitwell Best Form XVIII. Nov. 19, 1920, p. 158, Table I.) -11.18 Dp. From our chart, the point $(-6.0, +12.0)$

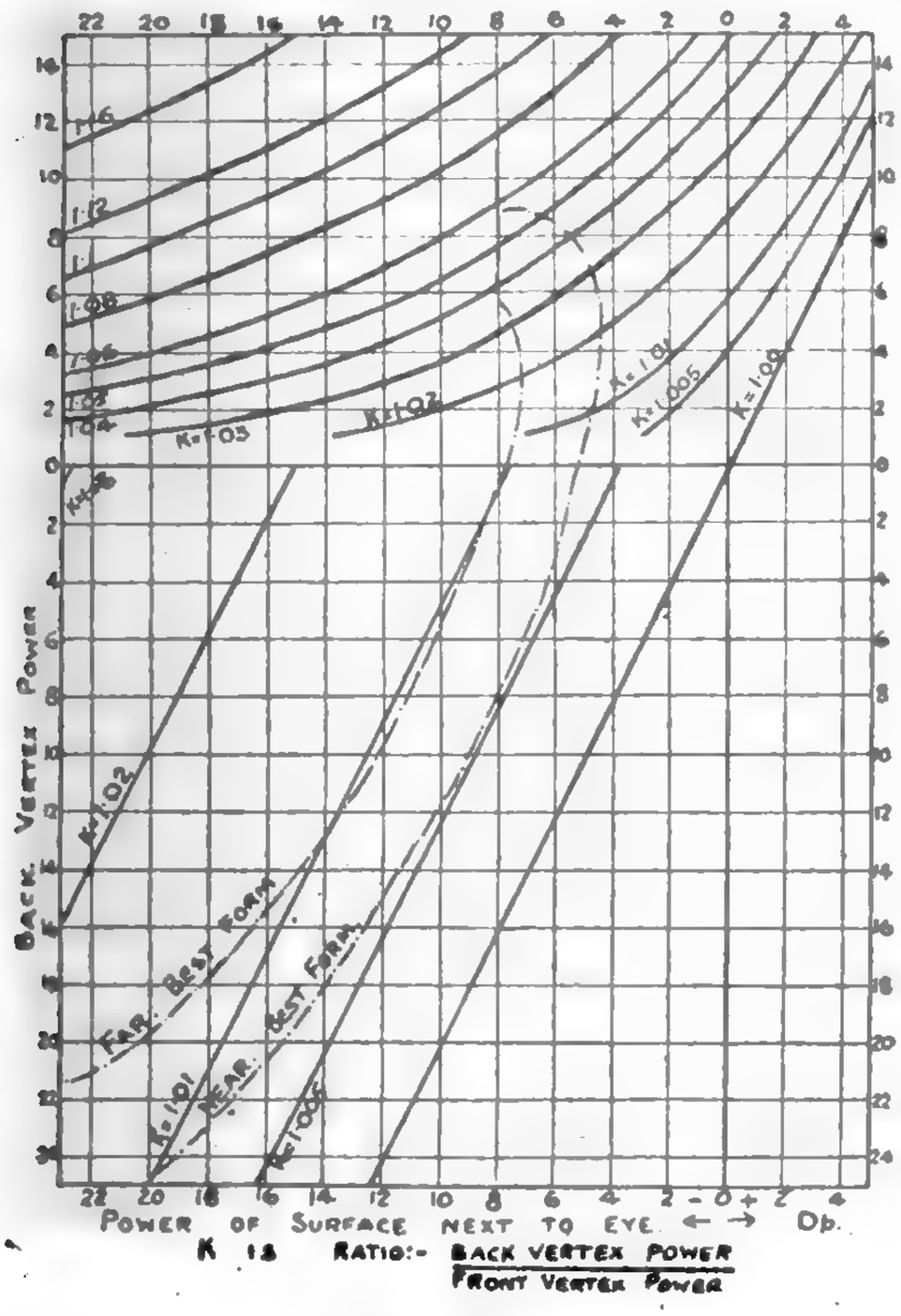


Fig. 13

lies close to the curve $k=1.07$ or the neutralising lens is -11.16 $\left(i.e.\frac{12.0}{1.07}\right)$. The agreement is remarkable considering the different methods of obtaining the same.

This constant k has another function. It determines the form of the lens.

Now the image distance A_2' is given by

$$A_2' = \frac{A_1 + D_1}{1 - \delta_1(A_1 + D_1)} + D_2 \text{ (exactly)}$$

a convenient expression if D_1 and D_2 are known. It is also given by Mr. Whitwell's relation,

$$A_2' = V_{12} + A_1\{1 + \delta_1(A_1 + 2D_1)\} \text{ (very nearly)}$$

a convenient expression if the back vertex and base-curve powers are known.

On the proposed double designation specification a still more convenient expression may be obtained.

Thus

$$A_2' = \frac{A_1 + D_1}{1 - \delta_1(A_1 + D_1)} + D_2$$

$$= \frac{A_1(1 - \delta_1 D_2) + (D_1 + D_2 - \delta_1 D_1 D_2)}{1 - \delta_1(A_1 + D_1)}$$

$$= \frac{A_1(1 - \delta_1 D_2) + V_{12}(1 - \delta_1 D_1)}{1 - \delta_1(A_1 + D_1)} \text{ exactly}$$

$$= \frac{kA_1 + V_{12}}{1 - \delta A_1} \text{ (very nearly)}$$

$$= V_{12} + kA_1 \text{ (only approximately)}$$

The last expression is a little more exact than simple transpositions; the penultimate expression will be employed below.

For symmetrical lenses we have

$$A_2' = (V_{12} + A_1)(1 + \delta_1 A_1) = (V_{12} + A_1) \text{ approx.}$$

Examples 1(a) and 1(c) in the last article of this series gave $A_2' = 1.96$ exactly for a symmetrical lens and $A_2' = +1.86$ exactly for a -6.0 Dp. base D.M. when $V_{12} = +6.0$ and $A_1 = -4.0$.

With the approximate expressions above we obtain 1.98 and 1.88 respectively.

Now if the distance correction be found by a test with a vertex marked lens V_{12}, then the ocular refraction is $R = \frac{V_{12}}{1 - \delta_2 V_{12}}$. This ocular refraction may be determined from the effectivity charts or by calculation. The ocular refractions are recorded in the table of symmetrical lenses below for various values of δ_2, viz., 12, 14, 16 and 18 mms. from the first principal point of the eye. The late S. D. Chalmers referred his lenses to equivalent lenses at the cornea; so also does Dr. Tscherning recommend this. The writer prefers the Donder's method.

If now an eye accommodates an amount N and according to the 'accommodative resources' (Dr. Sheard) this may vary between zero and about four diopters for most practical purposes, the near point Donder's refraction is

$$R_n = \frac{V_{12}}{1 - \delta_2 V_{12}} + N$$

This referred back to the spectacle is

$$A_2' = \frac{R_n}{1 + \delta_2 R_n}$$

Now there will be a choice of near object

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

position dependent on the work contemplated say one to four diopters *from the eye*, *i.e.* M (say)

Then $A_1 = \frac{M}{1+\delta_2 M}$. Where A_1 is the object vergence referred to the lens.

Hence a lens—V_{12} say—may be chosen which requires any ocular accommodation N to see a near object at M from the eye for the corresponding distance corrections V_{12} at δ_2 in front of the eye.

This lens may be determined from the expression

$$\frac{V_{12n}+kA_1}{1-\delta_1 A_1} = A_2' = \frac{\frac{V_{12}}{1-\delta_2 V_{12}}+N}{1+\delta_2\left(\frac{V_{12}}{1-\delta_2 V_{12}}+N\right)}$$

The form variation factor is given in k.

The Determination of Cardinal Points.

By G. F. ALEXANDER, M.B., C.M.

In *The Optician*, of September 12th, 1918, I published the following theorem enabling the cardinal points of a combination of any number of simple refractive systems to be easily determined, viz., "if 1, 2, 3,.....n are the successive surfaces, T_1, T_2, T_{n-1}, the successive distances between them, and l_1, l_2, l_3..... .....l_n the respective distances from them of the points in the axis to which rays originally parallel to it are refracted by them, and F the focal length for such rays, then

$$F = \frac{l_1 l_2 l_n.....l_n}{(l_1-T_1)(l_2-T_2).....(l_{n-1}-T_{n-1})}$$

Its demonstration was based on the deviation given a ray by these surfaces successively, but I am now able to supply a much simpler one as follows:—Let 1, 2, and 3 be convex surfaces and h_1, h_2, h_3, the respective distances from the axis at which a ray parallel to it is incident on them; P is the principal plane, and p its distance behind 3. Now from similarity of triangles

(1) $\frac{h_1}{h_2} = \frac{l_1}{l_1-T_1}$,

(2) $\frac{h_2}{h_3} = \frac{l_2}{l_2-T_2}$, and multiplying

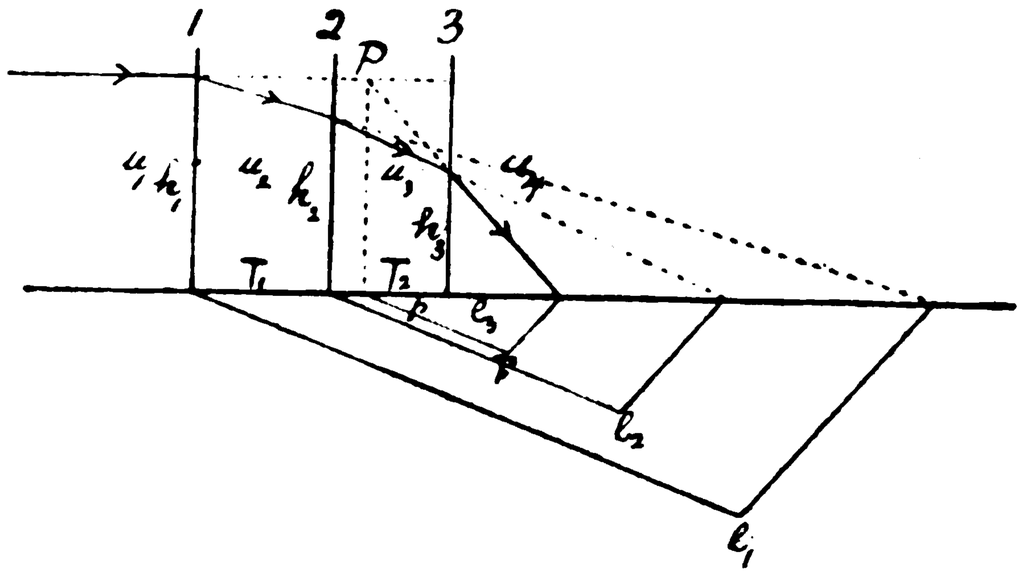
$$\frac{h_1}{h_3} = \frac{l_1 l_2}{(l_1-T_1)(l_2-T_2)}$$

(3) $\frac{P}{h_3} = \frac{F}{l_3}$: now as $P = h_1$, $\frac{F}{l_3} = \frac{h}{h_3}$

$$= \frac{l_1 l_2}{(l_1-T_1)(l_2-T_2)} \therefore F = \frac{l_1 l_2 l_3}{(l_1-T_1)(l_2-T_2)},$$

and $p = F - l_3$.

Obviously, this process may be continued to any number of surfaces and applied to concave as to convex surfaces. On reversing the direction of the parallel ray the focal length on the side of 1 and the distance of the principal plane behind 1 are similarly found, though as the focal lengths are to one another as the indices of the corresponding media the second may be found from the first by a simpler calculation than that required for the first; the nodal points are then obtained by



marking off from each focus towards the other the opposite focal length. For convex surfaces the distances l after the first which is the focal length of the first surface, are found as follows:—if μ_n is the index of the medium preceding the surface and r_n the radius of thi surface, $l_n = \frac{\mu_{n+1}}{\frac{\mu_{n+1}-\mu_n}{r_n} + \frac{\mu_n}{l_{n-1}-T_{n-1}}}$

For concave surfaces this is modified as demanded by the conjugates, while if a concave surface gives a virtual conjugate the corresponding l and T must be connected by the + sign.

Scarborough,

2nd January, 1922.

Death of Mr. A. L. Vincent.

We learn with regret of the death of Mr. A. L. Vincent, well-known as the senior partner in the firm of A. L. Vincent & Co., 37, Skinner Street, Clerkenwell. Mr. Vincent was at business as usual on the 7th inst., but was taken ill with bronchitis, and passed peacefully away in his sleep on the 12th inst., at his residence in Stamford Hill, N. The interment was at Abney Park Cemetery, Stoke Newington, on the 19th inst., the service being held at Amhurst Park Church. Mr. E. L. Vincent, son and surviving partner, wishes to convey his best thanks for numerous letters of sympathy that he has received from members of the industry.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Seven Styles

now made in

"OCENTRIC" EYEGLASSES

BRITISH MADE.



A Distinctive Model for Each Individual Taste.

RIMLESS MOUNTS & FRAMES. G.F. & SOLID GOLD.

0 series Short Plaquets Regular pattern
100 „ Normal Plaquets Regular Pattern
200 „ Long Plaquets Regular Pattern
300 „ For Centrally Drilled Lenses
(BENT UP PLAQUET ENDS.)
400 „ For Centrally Drilled Lenses
(CLAMPS ATTACHED BY SHORT BRACKET.)
700 „ For Centrally Drilled Lenses
(SWAN NECK BRACKETS.)
800 „ Regular Pattern with Double Straps

SAMPLES and PRICES WILLINGLY ON APPLICATION.

The British Ocentric Optical Co., Ltd.,

Wholesale and Manufacturing Opticians,

12 & 13, EAGLE STREET, SOUTHAMPTON ROW,

LONDON, W.C. 1

Telegrams—Ocentricco, Westcent, London. *'Phone—Holborn 560*

Cables—Ocentricco, London.

Digitized by Google

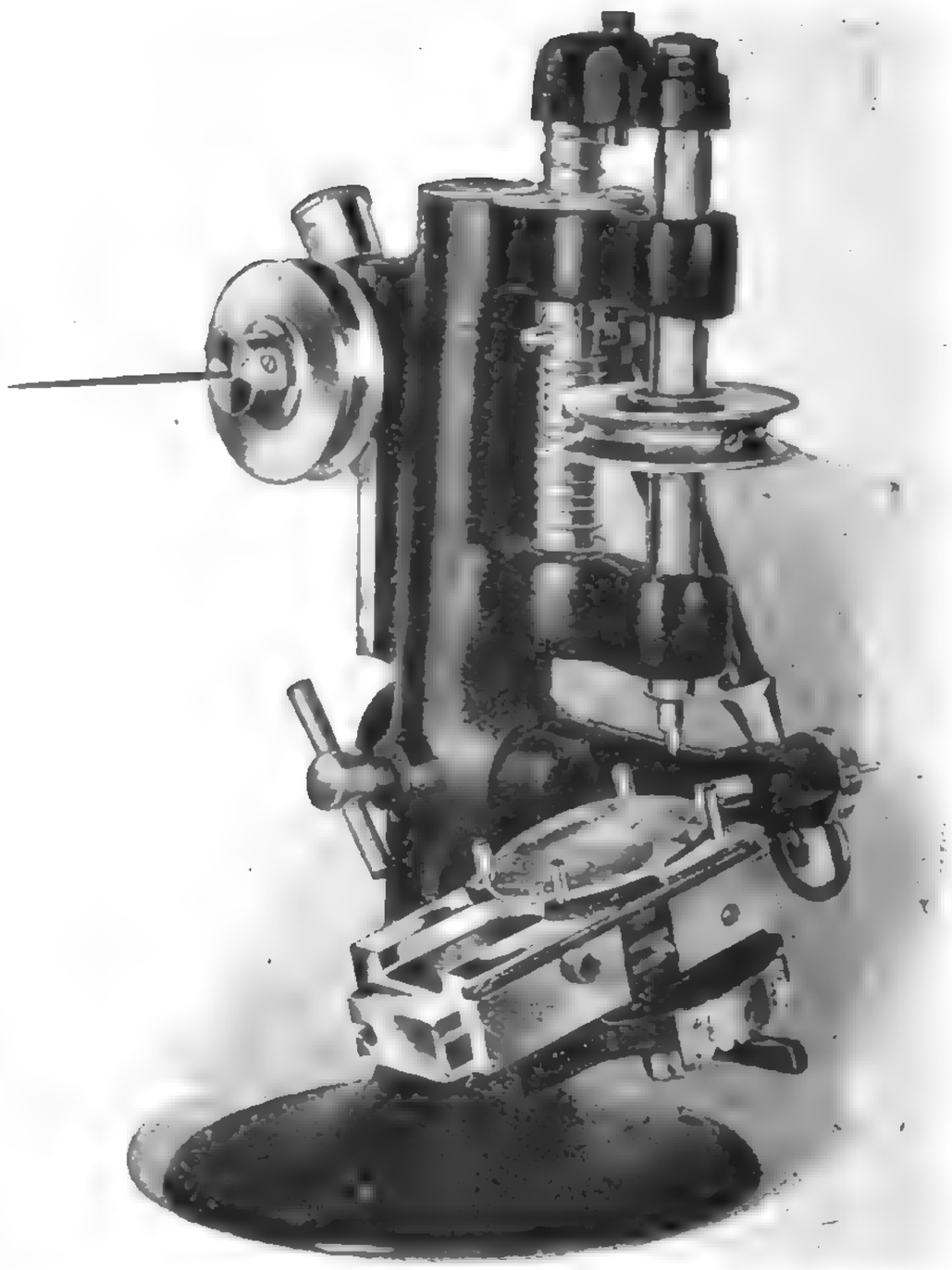
Original from THE OHIO STATE UNIVERSITY

The Universal Lens Drill

The Stoco No. 53-A

This well proven drilling machine, constructed with characteristic Stoco regard for durability, practicability and economy of operation, will drill deep curves as easily as flat lenses.

Its plain adjustments, positive chuck, and tilting table which can be locked rigidly in position assure unfailing accuracy in the location, the angle and the bore of the holes. The patented depth gauge allows the drill to cut only a trifle more than half way through the lens and the holes can be drilled above, below or on center and as near the edge as desired.



Manufactured by

THE STANDARD OPTICAL Co.,

GENEVA, N.Y., U.S.A.

Makers of High Grade Frames, Mountings, Lenses and Optical Machinery.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

Correction for Presbyopia and Hypermetropia.

Sir,—In reading Mr. Swaine's article, No. 9, in your issue of January 20th, 1922, I had to refer to his article No. 5 and in re-reading that article I noticed a reference to the following passage in my article on "Vertex Power," published in your issue of January 21st, 1921:—

"It may be pointed out that the error caused by prescribing a meniscus after the sight has been tested by means of a double-convex Trial Case lens is not of so much importance to the Presbyope as to the Hypermetrope. In the former case the error may be corrected by moving the object as well as by altering the accommodation; in the latter case the object being at a distance cannot be moved and the image is at a fixed distance from the last vertex and any error must be corrected by accommodation alone."

Mr. Swaine in his Article 5 says " but I do not quite follow the former's reasoning with regard to the trouble being of less importance to the presbyope than to the hypermetrope. I agree with Mr. Mayer that the presbyope may have the greater difficulty. The hypermetrope will be equipped correctly for distance by B.V.P. and if he has a sufficient accommodation or by a mechanical placing of the near object, will experience no difficulty (monocular vision only considered)."

What I wanted to express in my article was that the presbyope who only uses his glasses for near work always has the power of moving the object if his correction is not quite right. On the other hand the hypermetrope who has been tested for distance by means of double-convex lenses and who has been supplied with meniscus lenses of the same nominal power but of different back vertex powers cannot move the distant object if his correction is not quite right. If the hypermetrope is tested for distance by means of a double-convex trial case lens and is supplied with a meniscus it *must* have its back vertex power the same as that of the trial case lens and, when worn, its back vertex must be in the same position relatively to the eye as the back vertex of the trial case lens during the test.

A Whitwell.

Wimbledon.

Early Sight Testing.

Sir,—I had made up my mind not to address you again, as you have repeatedly mutilated my letters and made them read ridiculously. However, I hope you will not do so again, as I write nothing illegal or objectionable, and I therefore comply with your rules.

I feel compelled to take up my pen again owing to your remarks under the letter of Mr. H. Lazarus in your last issue, and at which I am very much surprised. In your issue of 4th Nov. last, I said, "I passed my examination in Calcutta in 1879," In your issue of 11th and 25th Nov. your correspondents asked "what examining body existed in Calcutta in 1879?" This question appeared to me to be so absurd that I did not trouble to reply as I considered any optician of any lengthy experience would surely know that there was no optical examining body either in Calcutta, England or America, or in any other part of the world as far as I know in 1879, but I said nothing in my letter about examining body, as none existed anywhere at that date.

In your last issue you say "This in no way disposes of Mr. Braham's claim to have passed an examination in 1879," which remark from a man of your vast experience and knowledge surprises me very much. If I had not passed an examination, how have I been able to practice daily for the past 42 years? How is it I was able to invent my refraction and astigmatic chart, registered at Stationers Hall in 1886? How was it I was the first man in England to give instruction in sight-testing, including astigmatism since 1886 up to the present date? How was it I was the first optical instructor in America in 1888 (the Fowlers' Optical Institute of New York, started a few months before or after me, I am not sure which)? A man could not very well have done this unless he had some instruction or passed some examination in his calling. I believe I have known you since somewhere about 1889, and you have known of me; therefore, I am more than surprised at your remark; but further information regard-

Digitized by Google Original from THE OHIO STATE UNIVERSITY

ing my examination I will willingly give at a proper time and place.

Now, may I ask a question? Suppose the late Dr. Critchett or Dr. Nettleship had examined a man on sight-testing in 1879, there being no optical examining body in those days, and the man had practiced for 42 years without a blemish on his professional character would you be justified or honest in saying that man was a fraud or quack?

Again let me ask, in 1894, when the British Optical Association started, what optical examining body did . . . pass? None! because there was no such body. I write with all due respect for them, but facts are facts. But you seem to wish to belittle me, probably because I am a travelling optician and not a member of either of the present day optical bodies.

G. Braham.

167, The Grove, Hammersmith.

[If correspondents will be good enough to omit from their letters anything that can be regarded as either legally or otherwise objectionable, they will be saved the annoyance of having passages blue-pencilled. We lay stress upon the "otherwise" here, because the literary columns of *The Optician* (like those of most newspapers) are denied to the prosecution of vendettas which, even in the absence of anything actionable, are offensive to other readers, who legitimately look on the text columns of the trade paper as voicing opinions that, however strongly disagreed with, are at least not directly cloaked in personalities. The controversy in which Mr. Braham is engaged is not with us but with trade correspondents, whose retorts we must say he invited. We have never said that Mr. Braham was a fraud or a quack. His letter is printed in extenso, except for deletion of several names, and for the omission of the concluding portion of it. We may just add that some of the passages in the letter seem to us rather inconsequential.—Ed.]

Two letters are unavoidably held over in type on account of pressure on our space.

Bifocal Lenses.

Messrs. Lever Bros., of 18, Hatton Garden, E.C.1., are introducing a new bifocal lens under the name of the "Kostules" (pronounced Cost You Less), which is of British manufacture throughout. Messrs. Lever Brothers state that the "Kostules" bifocal is supplied at low prices in meniscus and toric forms only, and that these lenses can be obtained from them in as quick time as they are noted for in connection with their other jobbing. On receipt of request, Messrs. Lever Brothers will be pleased to send on approbation a sample "Kostules" bifocal lens, together with the prices, etc.

We much regret that owing to a clerical error the telephone number of Messrs. T. A. Reynolds & Co., scientific instrument makers, of 40-42, Percival Street, Goswell Road, E.C.1., was printed against the name of another firm, Messrs. Reynolds & Bailey, 15-19, Vine Street, E.C.1. There is no connection between the two firms named, and we have to apologise for such annoyance as may be caused by this mistake.

Bondwell F.C. (C. W. Dixey & Son) defeated Bloom's Athletic F.C. by 7—0 at Lea Bridge Road on Saturday, Jan. 21st, and were altogether the better side. The game was played under wretched conditions, the pitch being inches deep in mud and slush, and rain pouring heavily for the most part, but Bondwell adapted themselves to playing conditions better than the visitors. It was a success fully merited, for although Bloom's played football which was good and surprisingly fast, they were vanquished by a side which displayed more dash and directness in going for goal, and blended with it a large amount of science in attack as well as soundness in defence. The outstanding feature of a keenly fought game was the work of the visiting goalkeeper, several of his saves were very fine. On Saturday, Jan. 28th, Bondwell F.C., oppose St. Andrew's Institute F.C., away at Edgware. Supporters are cordially invited. Kick-off at 2.45 p.m.

A discussion on "The Use of Light as an Aid to Aerial Navigation" will be opened by Lieut.-Col. L. F. Blandy, D.S.O., R.E., at the house of the Royal Society of Arts on Tuesday evening next (8 p.m.), at a meeting to be held under the auspices of the Illuminating Engineering Society.

Death of Mr. C. H. Bateman.

We much regret to learn that Mr. Chas. Henry Bateman, late a director of the firm of G. C. Bateman, Ltd., sight-testing opticians, died aged forty-four years on the 18th inst., at 29, Langdale Gardens, Hove, after only a few days' illness, from pneumonia following influenza. The interment took place at Patcham on the 21st inst.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

WHOLESALE TRADE ONLY.

Head Office:

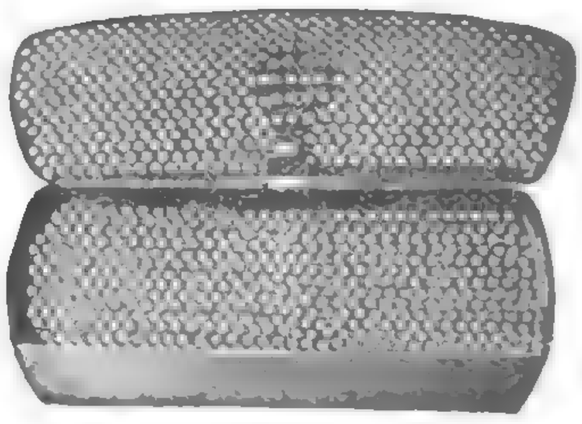
W. Smythe & Co. Ltd. 66 and 67, EDWARD ST. PARADE, Birmingham.

Branch Works—HOCKLEY and WALSALL.

Patent Optical Case Manufacturers

Telephones: 5587-2354 CENTRAL. Telegrams & Cables: "NOWATE, BIRMINGHAM."

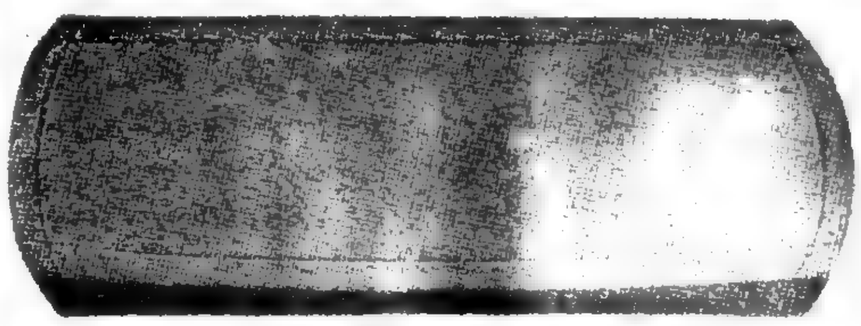
The Patent "NOWATE" Body →



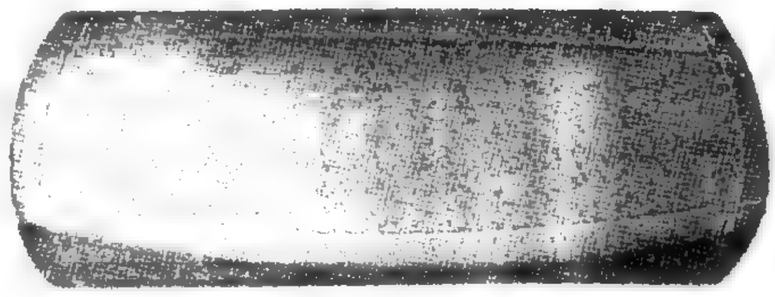
Advantages:

Light as Aluminium and Cheaper.
Stronger than Aluminium and Steel Bodies.
Leather and Lining does Not Peel Off.
Specially Suitable for Export and Hot Climates.

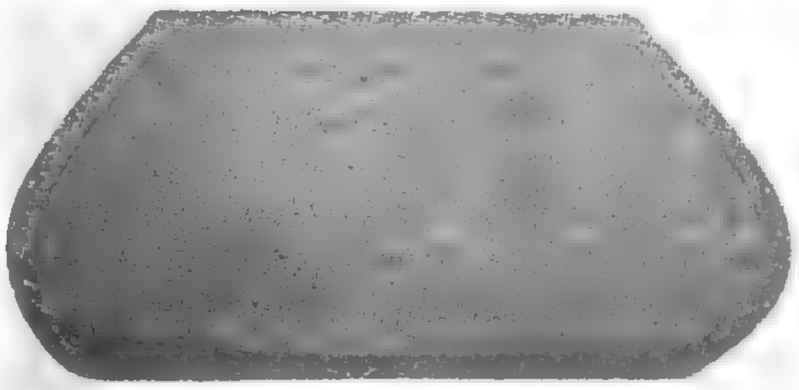
Patent Metal Spring Lid.



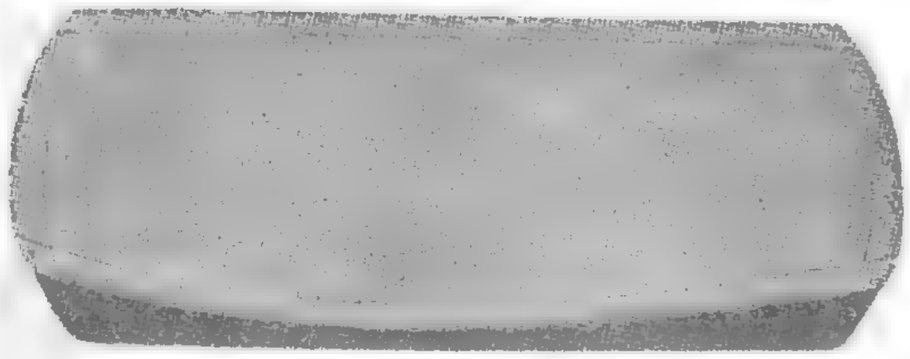
MODEL 5
FINGERPIECE EXTRA LARGE CURLSIDE 2.1.0 EYE



MODEL 4
FINGERPIECE. BOWSPRING RIMLESS ORDINARY SPIRAL. 2.1.0 EYE



MODEL 6
FRENCH ASTIG. PERFECTION AND CANADIAN FOLDERS



MODEL 3
CURLSIDE 00 EYE. 64 & 66 m/m RD

MODEL 1
ORDINARY SPIRAL TRIPLE BAR 2.1.000 EYE



MODEL 7
ROUND EYE

ILLUSTRATIONS HALF-SIZE. COMPETITIVE PRICES.

Also Makers of Frogmouth and Soft Leather Cases. Write for List and Prices.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"You Cannot TRADE SQ MARK *Buy Better"*

STEVENS' QUALITY
Optical Goods

UNQUALIFIED approval meets this celebrated line wherever introduced.

WE are sole agents for the United Kingdom and can invariably supply your requirements from stock.

One Quality Only—The Best Made

1/10th 12ct. Gold Filled

Specialising in the Fingerpiece Mount

Send us your enquiries for
Spectacles and Eyeglasses—Frames and Mountings

Complete Catalogues on Application

H. WILLIAMSON Ltd.
Optical Section
87/89 GREAT SAFFRON HILL, LONDON, E.C.1

General Optical Supplies—Prescription and Repair Work—
Fittings and Instruments—Optical Machinery

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

A Mine of Sales Helps!

Every other month, in the interest of better retailing and better business, we issue a 32-page sales publication, which, from cover to cover, is just jammed full of sales helps, practical ideas and dividend-paying suggestions for the up-building of the retail optical establishment.

We call it the "SHUR-ON CHRONICLE." In truth it's the retailer's guide to better merchandising methods, bigger volume, more profits and—an invaluable consumer goodwill.

We would like to add your name (without obligation, of course) to the 10,000 other optical specialists who are now enjoying and profiting by this unique sales and goodwill builder. Sign and return the tilted coupon.

Shur-on Optical Co.,

Rochester, N. Y.,

U.S.A.

Sign Here — Tear Off — Mail!

Without obligation on my part please send me the "Shur-on Chronicle" regularly as published.

Name .....

Street No. .....

City .....

County .....

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

UNCUT LENSES

OF EVERY DESCRIPTION

QUALITY AND PRICES DEFY COMPETITION

WRITE FOR OUR

LATEST PRICE LIST

OUR RX DEPARTMENT IS UNEQUALLED FOR

PROMPTNESS & ACCURACY

Telephone: HOLBORN 1620 (Private Exchange).

KIRK BROTHERS

WHOLESALE & MANUFACTURING OPTICIANS

Telegrams: KIRKOREX, HOLB. LONDON.

36, GRAY'S INN ROAD, LONDON, W.C.1

Candidates for the Examination of the **Worshipful Company of Spectaclemakers** can always be certain of receiving the most thorough and painstaking preparation at

THE SCHOOL OF OPTICS, LTD.,

Under the direction of Mr. LIONEL LAURANCE (Official instructor to the Company) and Mr. H. OSCAR WOOD.

General Optics, Visual Optics and Sight Testing.

The percentage of successful students AT THE FIRST ATTEMPT is consistently high.

Correspondence Courses, Afternoon and Continuous Day Classes.

Particulars on application to—

2, GUILFORD PLACE, LONDON, W.C.1

THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER

Subscription Form. **123-125, Fleet Street, London, E.C.4., England.**

Send a copy each week of THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER post free for which we enclose .....shillings for.....weeks.

UNITED KINGDOM 17s.

and ABROAD 20s.

Name..... .....

Business.....

Address.....

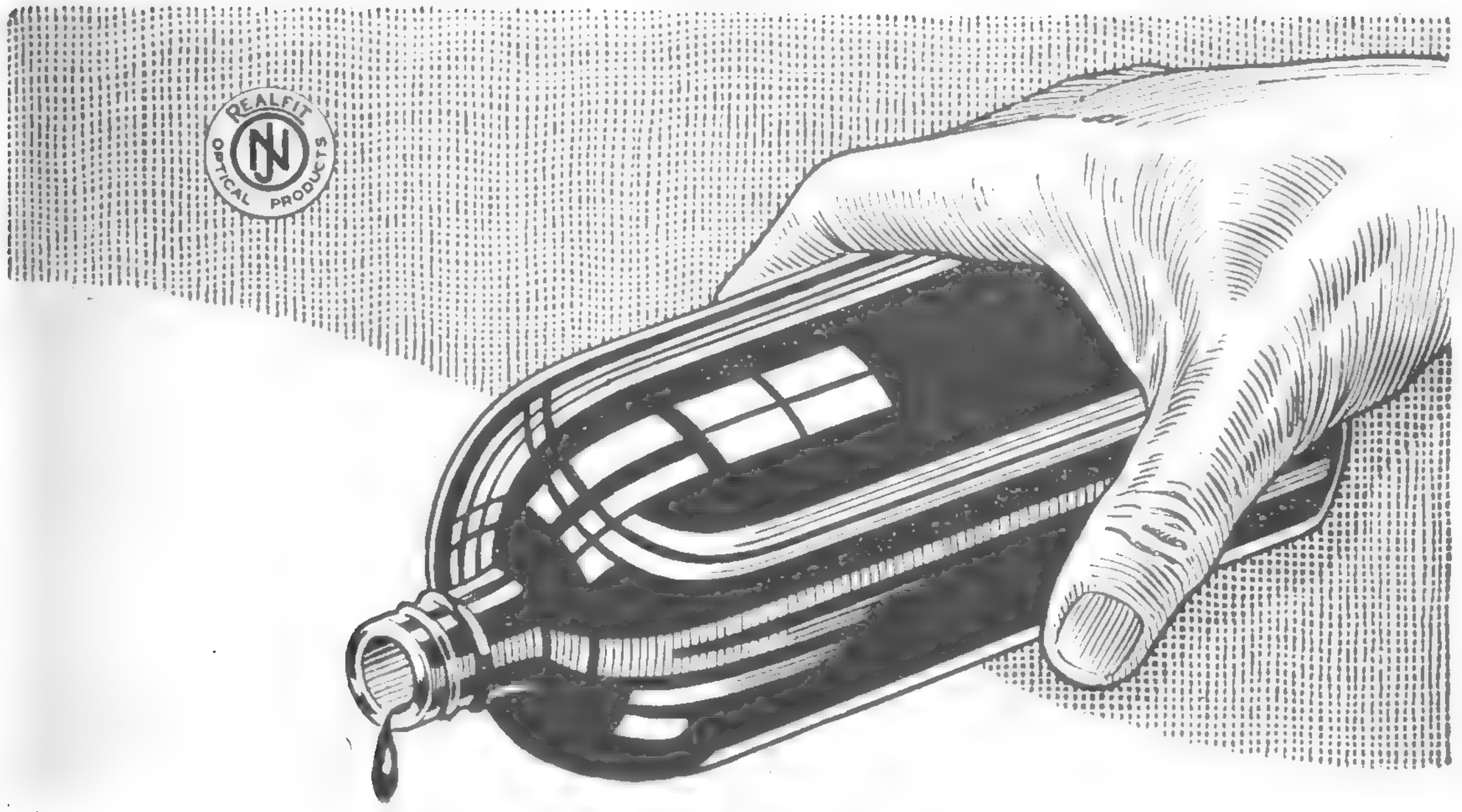
.....

A remittance of 17s. (or 20s. Abroad) for 52 issues includes "THE OPTICAL ALMANAC" post free.

Cheques made payable to The Hatton Press Ltd.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY





The hand of Time applies the acid test to merchandise and men. Many are found wanting; they fall by the wayside. A few possess that element which men call QUALITY. Time cannot efface their greatness.

REALFIT Finger Piece Frames and Mountings are Quality products. Whether you buy to-day or next month, *always* you can be certain of their uniform high standard—of their comfort, beauty and enduring strength.

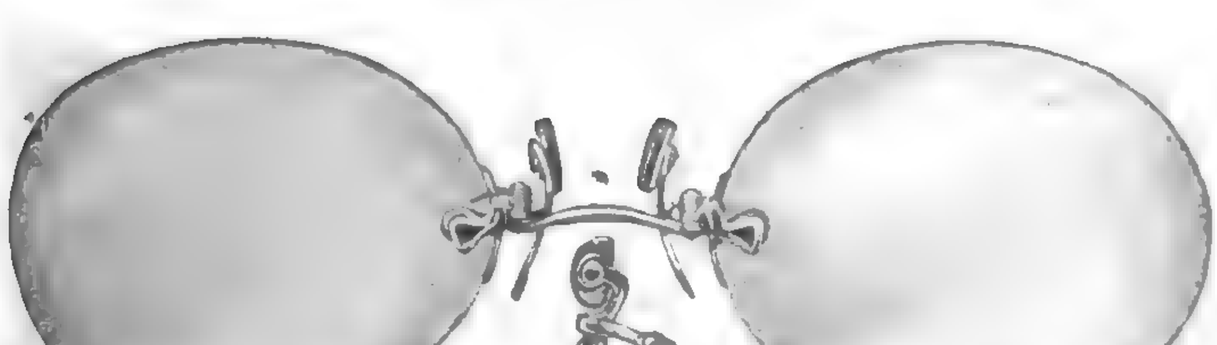
The best material is used throughout. Every part of the mounting is constructed with great precision.

No less than five inspections testify to the care exercised that no REALFIT should leave our factory unless it is absolutely perfect.

REALFIT

Finger Piece

Mountings and Frames.



Made in all standard sizes with a complete assortment of Guards. If your Wholesaler cannot supply you, write us.

NEW JERSEY OPTICAL Co.,
Newark, N.J. . . . . U.S.A.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Re British Lens Grinding Company Limited (In Liquidation).

For sale the Lease of Factory at Kingston-on-Thames fully equipped with up-to-date Plant (electrically driven) for the manufacture of Optical Lenses. Also quantity of First Quality Bi-Spheres and Peris Lenses together with Stock of Materials. Full particulars on application to Lord, Foster & Company, 37, Walbrook, London, E.C.4.

Re Dioptrics, Ltd., Wholesale Manufacturing Opticians (In Voluntary Liquidation). The whole of the remaining Stock-in-Trade will be sold by Tender in separate lots on Tuesday, February 7th, 1922, at 3 p.m.

Particulars of Stock, Conditions of Sale, and form of Tender can be obtained from the undersigned:—

THOS. DUTTON (DUTTON, ARMSTRONG & CO.),
4, Piccadilly, Manchester.
or
G. H. LAWTON (E. LAWTON & SON),
14, Brown Street, Manchester.
Joint Liquidators.

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d. per word: for replies under Box No. 8d. extra.

Address of Office must be calculated as six words.

INSTRUMENT WORK Wanted. Experimental or repetition. F. E. Boynton, 391, St. John Street, E.C.1.

FOR SALE. Half-plate stand camera, mahogany, 10" ext. Beck-Steinheil Unofocal Ser. 1., No. 5. *f*/6 with Beck Celverex shutter, T.B. to 1/80 sec., 3 mahogany double dark slides, stand, focusing cloth, waterproof case, the whole £3 10s. Also ¼-plate Holborn reflex, magazine 12, Ilex, R.R. *f*/77. T. and I to 1/100 sec. Leather case, £2. Please address, Box 3508, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Employment Bureau. *Concluded from page 8*

GOOD All-round gold frame maker and jobber, first-class references, could take charge. Box 5840, c/o "The Optician," 125, Fleet Street, E.C.4.

LADY Assistant require post, 6 years' experience sight-testing, retinoscopy, repairs, etc. Can take charge. Highest references. Box 5839, c/o "The Optician," 125, Fleet Street, E.C.4.

ABLE Experienced successful refractionist with ready capital desires position in good class business where proprietor would like to retire gradually. Excellent credentials. Qualified. 9, Upper Belmont Road, Bristol.

SURFACING Charge Hand seeks situation, used to first class work only, 20 years' experience, distance no object. Box 5838, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Assistant with wholesale experience, shorthand typing advantage. Letters, full particulars, age, experience, salary. Ross-Jenkins, 31, High Holborn, W.C.1.

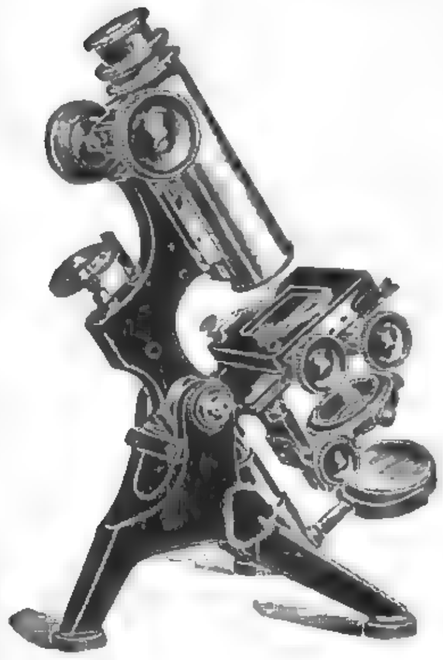
TRAVELLERS wanted, London and Provinces by very competitive wholesale firm. Write stating qualifications and references. Box 5837, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., 27, desires berth as assistant or manager, keen salesman. London preferred. Box 5845, c/o "The Optician," 125, Fleet Street, E.C.4.

SELL WATSONS' BRITISH-MADE

MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,

313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1937.

Elliott Optical Co.,

104 & 105 GT. SAFFRON HILL,

LONDON, E.C.1

TRADE EC MARK.

There is no Better House for

Rx Work.

RXS. RETURNED PROMPTLY, ACCURATELY DISPENSED and at REASONABLE PRICES.

Complete Outfit of Rx Stationery supplied, Free of Charge.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

FOR SALE.

Six Craigleith Optical Grindstones.

Three size 22" diameter x 2¼" face and three size 22" diameter x 1½" face complete with Pulleys to run by power fast cutting and good finish put on edge of lens at same time. *For immediate disposal.*

Prices on application to—

JOHN BAIRD, Manufacturing Optician, 68/70, Mitchell St., Glasgow.



OPTICAL BLOCKS

To illustrate all features of Optical Service. Write for lists.

CHEMISTS' DESIGN SERVICE

12 Humberstone Gate, LEICESTER.

PERCY S. DE SAULLES.

Manufacturer of . . .

MICROSCOPICAL GLASS SLIDES.

Micro Cover Glasses, Glass Cells and Cavity Slips, etc.

The Platts, Amblecote, Stourbridge.

BAKER 94 HIGH HOLBORN LONDON

Estab. 1765

The JANUARY issue of our

SECOND-HAND CATALOGUE

comprising about 2,500 Optical, Scientific and Photographic items (all guaranteed perfect) is just out.

WRITE TO-DAY FOR A COPY, POST FREE.

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.

C. O. DYMOND. M.I.Mech.E., F.I.C.P.A

W. P. THOMPSON & Co.,

12, CHURCH STREET, LIVERPOOL.

Chartered Patent Agents.

H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A.

J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

T. WHEELER,

Scientific Instrument Manufacturer,

Specialities: POCKET SURVEYING and AERONAUTICAL ANEROIDS.

217, GOSWELL ROAD, LONDON, E.C. 1

ESTABLISHED 1878 TELEPHONE CITY 419

The Optical Society.

President: Mr. R. S. WHIPPLE, M.I.E.E.

Vice-Presidents: Prof. FREDERIC J. CHESHIRE, C.B.E., Director of the Technical Optics Department of the Imperial College of Science and Technology, South Kensington; Sir HERBERT JACKSON, K.B.E., F.R.S.

Hon. Treasurer: Mr. I. G. AITCHISON, B.A., LL.D.

Hon. Secs.: Mr. L. C. MARTIN, B. Sc., Imperial College of Science and Technology, South Kensington S.W.7 and

Papers' Secretary: Mr. F. F. BRYSON, M.A., B.Sc.

SPECTACLES & EYEGLASSES.

Their Forms, Mounting and Proper Adjustment

by R. J. PHILLIPS, M.D.

Fourth edition revised with 56 illustrations.

Price 6s. 6d. Post Free 7s.

THE HATTON PRESS, Ltd., 125, Fleet Street, London, E.C.4

WE ARE

All obliged to consider carefully what we pay for our goods now-a-days, and even a small saving, if often repeated is worth while, provided quality is there.

Quality is our first consideration, and no matter how high the price paid, it is not possible to obtain better quality than W.O.W

You want proof? Then send a trial Rx order to W.O.W.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY: DUDDEN HILL LANE, N.W.1

MANY SUCCESSES IN THE EXAMINATIONS!

Your Opportunity to

QUALIFY IN OPTICS

PRACTICAL WORK. Students taking the Course may receive personal tuition in the practical work AT ANY TIME DURING THE COURSE.

Expert Tuition by Correspondence for the SIGHT-TESTING DIPLOMAS of the Worshipful Company of Spectacle Makers (F.S.M.C.), or the British Optical Association (D.B.O.A.).

Write for full particulars—

C. A. SCURR, M.P.S., F.S.M.C., F.I.O., etc.

64, High Street - - - - BARNET.

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,

DANDURAND BLDG., MONTREAL.

Cable "Optical" A.B.C. Code 5th. Edition.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

A.—Advertisements unaccompanied by cash cannot be inserted. *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

MECHANIC used to meterological and general instrument work, hand-turning bench, finishing and lacquering. 18 years' experience, any distance, town or country. F. Orford, 83, Ashmore Road, Paddington, W.9

YOUNG MAN, 21, studying for F.S.M.C., desires progressive position. Box 5834, c/o "The Optician," 125, Fleet Street, E.C.4.

CAPABLE Surface Worker desires change, South of England preferred, experienced in kryptoks, tories, etc. Disengaged when suited. Box 5830, c/o "The Optician," 125, Fleet Street, E.C.4.

MANAGER'S Situation wanted, preferably in Yorkshire or Lancashire, by experienced ophthalmic optician who would require about 6 weeks to dispose of his present ophthalmic business. Married. Aged 27. Excellent salesman. Box 5835, c/o "The Optician," 125, Fleet Street, E.C.4.

JEWELLER-OPTICIAN'S Son, 21, passed major part S.M.C., desires post with optician, London, where good practical experience can be obtained. Vennall, High Street, Chesham, Bucks.

LADY, 25, seeks re-engagement in optical trade. Trained under Ministry of Munitions, had two years' experience as surfacer and polisher, now learning bevel and rimless edging. Write, E. W. Shepherd, 111, Broadwater Road, Tottenham.

REFRACTIONIST, aged 20, 4 years' experience, prescribed over 10,000 cases, seeks employment. V.K., 1, Dewhurst Road, West Kensington Park, W.14.

FIRST-CLASS Lens surfacer requires situation, London only. Charge preferred. 40 years' experience. A.S., 80, Prebend Street, Islington.

ASSISTANT for Yorkshire town. Must be careful refractionist. Full particulars stating wage required to Box 5844, c/o "The Optician," 125, Fleet Street, E.C.4.

GOOD All-round jobber and bevel and rimless glazing and fitting requires situation, retail optician with own plant preferred. Box 5843, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., aged 24, desires change as assistant or branch manager. London or Brighton districts preferred. Moderate salary. Apply, Box 5842, c/o "The Optician," 125, Fleet Street, E.C.4.

CAPABLE and well educated assistant requires position. Passed preliminary F.S.M.C. Thorough knowledge of sight-testing. Box 5841, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED Sight-testing optician required in old established business, jewellery experience an advantage. Henry Wells, By Royal Appointment, Shrewsbury.

ASSISTANT qualified for sight-testing, London. Send full particulars, photo, salary required to Box 5832, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS Lens Surfacer requires situation, 9 years' experience with London firms. Apply, J.S., 80, Prebend Street, Islington, N.1.

APPRENTICESHIP required for a well educated youth, with well established provincial optician, to live in. 118, Wellington Road, South Hounslow.

MANAGER or first assistant requires berth, good refractionist and able to take full charge of workshop, excellent references. Apply Box 5826, c/o "The Optician," 125, Fleet Street, E.C.4.

RELIABLE refractionist, keen business man, 12 years' experience, seeks re-engagement as branch manager or assistant. Passed part B.O.A. Highest references. Box 5831, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG LADY, F.S.M.C., desires position as optician's assistant. London wholesale, Provincial retail experience. Keen and willing, Excellent references. Box 5824, c/o "The Optician," 125, Fleet Street, E.C.4.

CAPABLE Assistant in need of berth requires position with retailer. All jobbing repairs, etc. London or Provinces. F. Gasson, 52, Battersea Park Road, S.W.11.

REFRACTIONIST, over 20 years' sight-testing experience, retinoscopy, etc. Good salesman, seeks engagement. Reply, Optician, 78, Durham Road, Sparkhill, Birmingham.

QUALIFIED Refractionist (F.B.O.A.), requires post as manager or first assistant. Quick and accurate refractionist, good salesman; first-class experience. Excellent credentials. Casson, 11, Elmwood Grove, Mount Street, Batley.

POSITION wanted by qualified refractionist, high-class experience, excellent credentials. Good appearance and address. Disengaged. F.B.O.A., F.S.M.C., 26, Somerville Road, Bristol.

OPTICIAN'S Son, between 20 and 21, passed B.O.A. examination, certificate in November. Capable refractionist, thoroughly practical, gentlemanly address, desires position, North preferred. Box 5827, c/o "The Optician," 125, Fleet Street, E.C.4.

QUALIFIED Assistant, 21, seeks re-engagement, 2 years' sight-testing experience. Thorough knowledge of optical workshop. F.S.M.C., 59, Eden Street, Kingston-on-Thames.

YOUNG MAN, 20, desires position with good-class firm of opticians, 2 years' experience. Passed Prelim. S.M.C. Knowledge of sight-testing. Reply, Box 5820, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN, 27, requires situation in retail optical business as learner. No previous experience. Can do book-keeping, etc. Box 5819, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. with good all-round experience requires position as manager or first assistant. Please state salary offered in first letter. Box 5812, c/o "The Optician," 125, Fleet Street, E.C.4.

SURFACE Worker desires situation. 16 years in London. Experience in wholesale and retail. Well up in all glass work. Good knowledge of glazing and drilling. Able to take charge. Box 5813, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A., 22, wants permanent situation with good class firm. Five years' experience as refractionist. Box 5818, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED Situation as first-class all-round gold worker and jobber. Address, E.A. 11, Spencer Road, New Southgate, N.

EXPERIENCED Refractionist and keen business man desires post as branch manager or first assistant. Age 30, tall, passed part B.O.A. Apply, "Optics," 24, High Street, Hastings.

WORKING JEWELLER, age 30, studying optics, would like situation with optician, in Manchester or district. Well up in repairs. Apply, A. Gough, 26, Scarisbrick Road, Levenshulme, Manchester.

CAPABLE MAN, with good experience in wholesale and jobbing. Understands all about prescription work, both warehouse and workshop. Has also wide experience in retail as refractionist and handling of scientific instruments and general optical goods. Would take management or consider partnership in good firm. Highest references. Box 5815, c/o "The Optician," 125, Fleet Street, E.C.4.

Concluded on page 6.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

R. ARCHER & SONS LTD EST 1859



Manufacturing Opticians,

WHOLESALE AND EXPORT.

1, AMWELL STREET,

CLERKENWELL, LONDON, E.C.1

The Prices of Prescription Work.

***IT IS CURIOUS** how frequently the prices of prescription lenses are canvassed and how seldom the quality, one would imagine that a toric—for instance—"by the river's brim," a simple toric "was to him, and it was nothing more." **YET NOTHING IS SO IMPORTANT** in connection with prescription lenses as their perfectness, and the amount of faulty work that is met with to-day is considerable. We make no such ridiculous pretension as that of being the only people who can do the thing properly, but we confidently claim to work and to fit prescription lenses of unusually high quality and accuracy. It must be partly for this reason that the volume of prescription orders has been increased so considerably with us—especially during the past two years—and we respectfully commend these facts as worthy of consideration.*

TRUST ARCHERS.

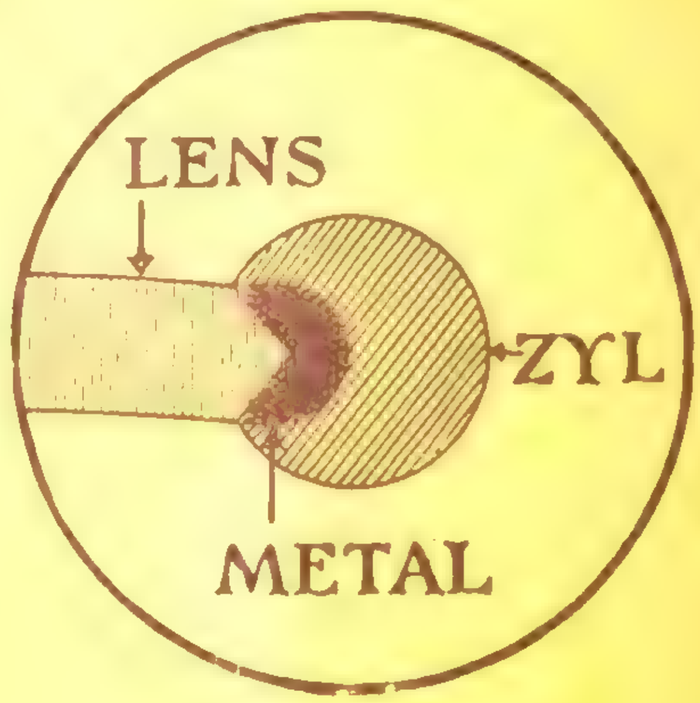
Digitized by Google

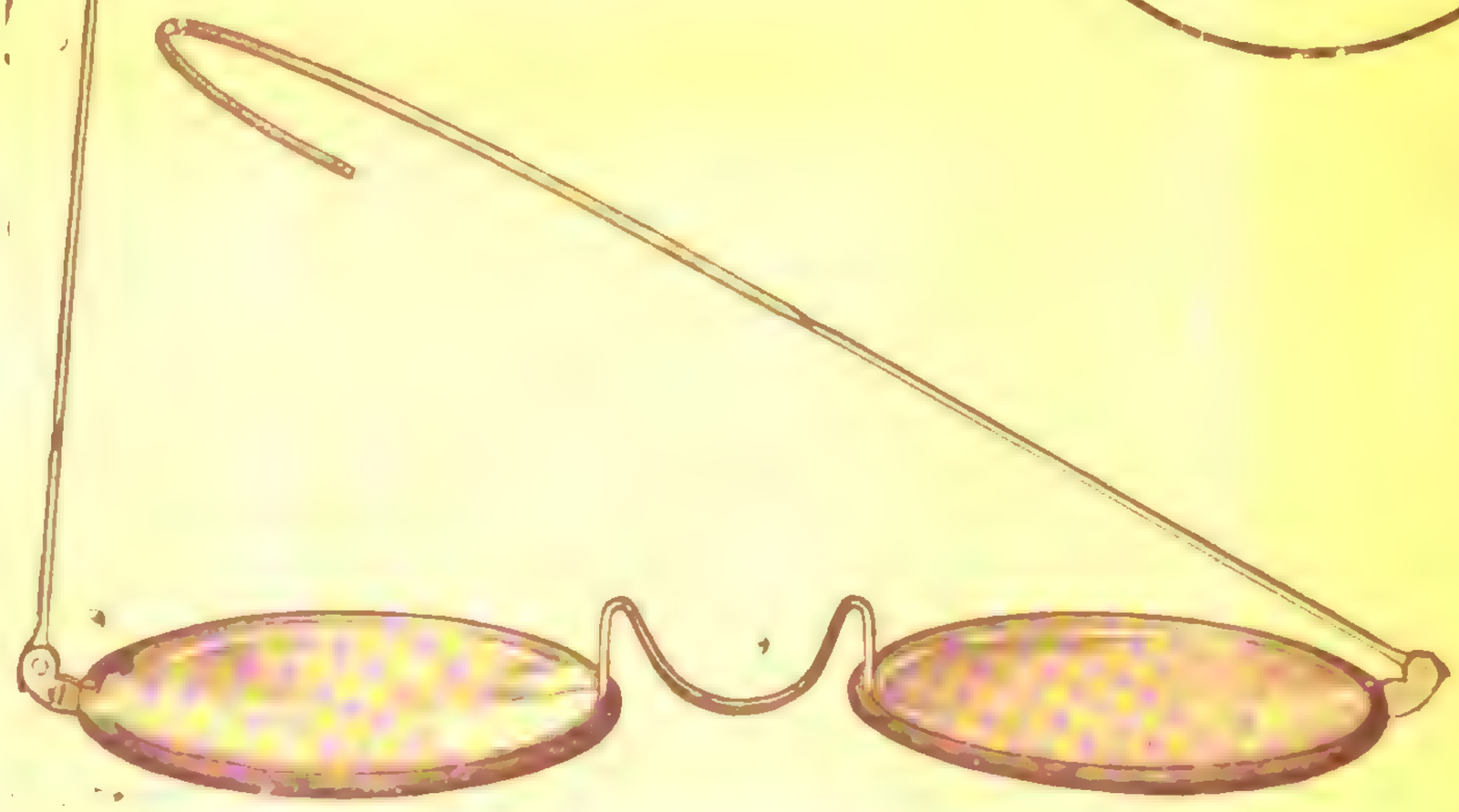
Original from THE OHIO STATE UNIVERSITY

THE OPTICIAN
Reg. at G.P.O. as a Newspaper

AMERICAN·OPTICAL·COMPANY.LIMITED

THE POWER
BEHIND THE RIM.





When you sell a metal Zylo. Frame be sure that you make a permanent customer and not merely a transient sale by sending out a Wellsworth Windsor. These Frames are built to please both you and your customer. They have the inlaid metal eyewire—the power behind the rim —which holds the lens firmly and accurately in position. Moreover the Windsors have another feature entirely new in the Spectacle world—the complete absence of disfiguring metal patches at the points where temples and nose-piece join the Zylo. rim.

Wellsworth Windsor construction is protected by British Letters Patent. Beware of infringements.

WELLSWORTH

TRADE MARK (Reed.)

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C. 4. (Printed by The Century Press, Fulham). Jan. 27, 1922.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT-MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1610 FRIDAY, FEB. 3, 1922.

ROSS BINOCULARS.

British Government Tests have proved these to be the finest Binoculars in the world.

Send for our new catalogues and terms.

ROSS Ltd., Clapham Common, LONDON, S.W. 4

ELLIOTT'S Rx SERVICE

leaves nothing to be desired.

ACCURACY—PROMPTNESS and REASONABLE PRICES.

104/5, GT. SAFFRON HILL, E.C.1



ARTIFICIAL EYES.

HIGHEST QUALITY.

LOWEST PRICE. WIDEST VARIETY.

R. ARCHER & SONS, Ltd.,
1, Amwell Street, London, E.C.1

Reg'd at the G.P.O. as a Newspaper PRICE 4d Subscription Rate (Inland) 17s.
Postage in United Kingdom 1d

Digitized by Google
Original from STATE UNIVERSITY

AMERICAN·OPTICAL·COMPANY, LIMITED.

WELLSWORTH GOLD-FILLED

GOLD-FILLED—Webster's Dictionary:—"A substitute for solid gold consisting of a base metal mechanically covered with a layer of gold of appreciable thickness and calculated to wear much longer than plated ware."

GOLD-FILLED—Wellsworth:—A spectacle or Eyeglass combining skill of workmanship, ease of adjustment and durability of wear with moderate price.



If you wish to test the truth of the above definition of Wellsworth GOLD-FILLED, order Wellsworth goods from your wholesaler—and you will be convinced.

WELLSWORTH

TRADE Ⓐ MARK (Regd).

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

GEORGE CULVER LTD

Manufactuting Opticians,

JOBBING AND PRESCRIPTION WORK

ACCURACY,

NEATNESS,

PROMPTNESS

Large and full stocks of English made Lenses of all combinations. Orders can be executed promptly.

OPTICAL WORKS:
WHITE LION STREET,
PENTONVILLE,
LONDON, N. 1

TELEPHONE:
NORTH 369 and 371.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

J&R F LTD

TORICS.

Toric prescriptions can only be satisfactorily produced by a firm accustomed to high grade work.

We have made a feature of this work since torics were first introduced, now many years ago, during which time we have constantly been acquiring valuable experience and establishing the finest possible equipment.

Send your next toric job to any of the addresses below.

J. & R. FLEMING LTD.,

Telephone:
HOLBORN {814 / 815
HOLBORN {2788 / 2789} Prescription Dept.

136-148 Clerkenwell Road,
LONDON, E.C. 1.

Telegrams: "OTTICO." LONDON.

Branches with Prescription equipment:

J. & R. FLEMING (Brgm.), Ltd.
6, Key Hill Drive,
BIRMINGHAM.
Phone: Central 2569
Telegrams: "Brahma."

15a, CUSTOM HOUSE ST.,
CARDIFF.
Phone: Cardiff 743
Telegrams: "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1665.
Telegrams: "Ottico."

8, SHUDEHILL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

J&R F LTD

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master:
The Rt. Hon. VISCOUNT HILL, L.C.C.

Upper Warden:
CHARLES E. SEBAG-MONTEFIORE, Esq.

Renter Warden:
HARRY HYLTON-FOSTER, Esq., Past Master.

Director of Examinations:
The Rt. Hon. Sir WILLIAM HART-DYKE, Bt., M.A., Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C.4.

Official Instructor:
Mr. LIONEL LAURANCE.

Director of THE SCHOOL OF OPTICS, Ltd., 2, GUILFORD PLACE, W.C.1.

The NEXT EXAMINATIONS

of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in May, 1922.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,610

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. CITY 3618.

LONDON, FRIDAY, FEB. 3, 1922

Scientific Handbooks.—A distinctly valuable addition to be made to the list we published of text books on scientific instruments is the work on "Adjustment and Testing of Telescope Objectives" issued by Messrs. T. Cooke & Sons, of Buckingham Works, York. This books appeals not only to users of and regular dealers in telescopes but also, we think, to those opticians even whose occupation is solely the prescribing of spectacles. For it need hardly be said, there are customers the optician not infrequently meets who are users of one or other of the popular scientific instruments—telescopes, besides microscopes, cameras and so on—and are familiar with the optical phenomena involved, besides having some acquaintance perhaps with the optical principles underlying them. Obviously, a refractionist, although he may limit his trading to the supply of spectacle lenses, is expected by the public to be an optician with an all-round knowledge of optics, just as an oculist is a medical man having an all-round knowledge of medicine. It is not at all necessary indeed, that a retail optician should go far into the mathematical principles of optical design. For that is

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

specialism, and specialism of a very advanced order. It is the province of experts among the manufacturers and users of compound optical instruments. But any intelligent and instructed refractionist should find it easily within his power to master the rudiments at least, of the use and adjustment of instruments such as we have mentioned. There is no call for anything beyond that knowledge of optical principles which is common to advanced amateurs who possess a telescope, microscope or camera. It is not of the comparatively few advanced amateurs we are thinking here however, but the many who own and employ some instrument with but very little knowledge of the science applied in its design. Such people are apt to make enquiry of an optician with regard to any little trouble in adjustment, etc. And professional policy, indeed self respect, makes it desirable that an optician should know just a little more than many of his customers know about such matters. So far as the telescope is concerned, this knowledge is conveyed most simply and explicitly in the little book under notice.

* * *

A Handbook of the Telescope Objective.—Messrs. Cooke's publication, of which the third edition is before us, covers the whole practice of the handling of telescope object glasses. The first test and if necessary adjustment to be applied to an astronomical telescope is that for "squaring on" of the objective, which is the condition when the optical axes of eyepiece and object glass coincide. Any departure from this condition involves astigmatism (familiar in the simple case of spectacle lenses); and the defect of coma is also liable to make its appearance in a greater or less degree, dependent on the form of the objective. Good telescopes, of over 3ins. aperture, are commonly provided with triple pairs of set screws to facilitate bringing the o.g. cell to the exact position of axialarity. Photographic illustrations of star images obtained, with full descriptive matter in the text, make it easy for anyone to put the telescope objective in axially correct adjustment, which must be done before any critical judgment can be formed of the quality of the glass. The most important defect to be looked for therein is chromatism; and the tests for it here explained may be the first or the only ones to be applied by an instrument dealer when examining a small telescope, terrestrial or other. The limited sense in which either a Ramsden, Huyghenian or erecting eyepiece is achromatic is clearly explained; and in this connection stress is laid on a factor often overlooked, the chromatism of the eye—which is considerably more in evidence when using the relatively low magnifying powers than high ones. Instructions are given for demonstrating chromatism of the eye by means of a reflector with eyepiece removed. Generally, this instructive chapter will prove most interesting to those sight-testing opticians even who never handle an astronomical telescope. Some of the topics discussed are elaborated later in the book, in Mr. H. Dennis Taylor's paper on "Secondary Colour Aberrations of the Refracting Telescope in Relation to Vision."

* * *

Here it is made to appear that for visual focusing, in many cases the approach to whiteness rather than maximum luminosity of the disc image of a point of light is what determines the location of the focal plane. Then the "focal layer," or limit to depth of focusing for the unaccommodated eye, is defined and discussed. Important deductions are made, throwing doubt upon rules which have been accepted as practically self-evident—as indeed they are self-evident on the assumptions commonly made. Thus for ordinary types of refractors, the proposition that light-grasping power varies as the square of the aperture is not necessarily true, and may be very grossly misleading. The received estimates of stellar magnitudes are affected by this. After imperfect achromatism, the next defect dealt with in the book is faulty centering of the o.g. lenses relatively to one another. Astigmatism, due to bad figuring or annealing, defective material or mechanical strain is then discussed, and a simple procedure is given for ascertaining whether it occurs in the objective, the ocular or the observer's eye. Of the visual error it is remarked that "in many individuals astigmatism is found to be *variable* in amount, one day the eye may be almost free from the defect and on another day it is present to a serious degree." The tests are described for positive and negative spherical aberration; also zonal aberration. Chapters on the perfect figure and the theory of formation of the star image are followed by a practical discussion of mechanical strains and of the general treatment of objectives. Here the important discovery that a superficial film of tarnish increases the transparency of glass is adequately described.

* * *

Towards the end of the book a critical comparison is made between the knife-edge method of testing and the direct focusing

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

method which is recommended. The principal use of the first mentioned method, is that with objectives of *f*/15, it is possible to find the focus with no greater error than the 200th of an inch. Other contents of the volume are a description of the Cooke photo-visual objective, and two further R.A.S. papers by Mr. H. Dennis Taylor—one of them explaining the design of a perfectly achromatic refractor. We can safely recommend this work to very many of our readers. If a customer should mention the faulty performance of his telescope, it is of course not necessary to offer to undertake adjustments, which may be a matter for the instrument manufacturer; but it is well to be able from a description of the symptoms to hazard at least an intelligent guess as to their cause.

Geometrical Ophthalmic Optics.—XI.

By WILLIAM SWAINE, B.Sc.

By employing the effectivity charts and the *k* charts (fig. 13) and proceeding step by step the following tables were deduced. This eliminated any cumulative error in approximating early. The tables show the ocular distance refraction; each set of tables varies with the form. It is hoped that they are self-explanatory. Only positive lenses are given in

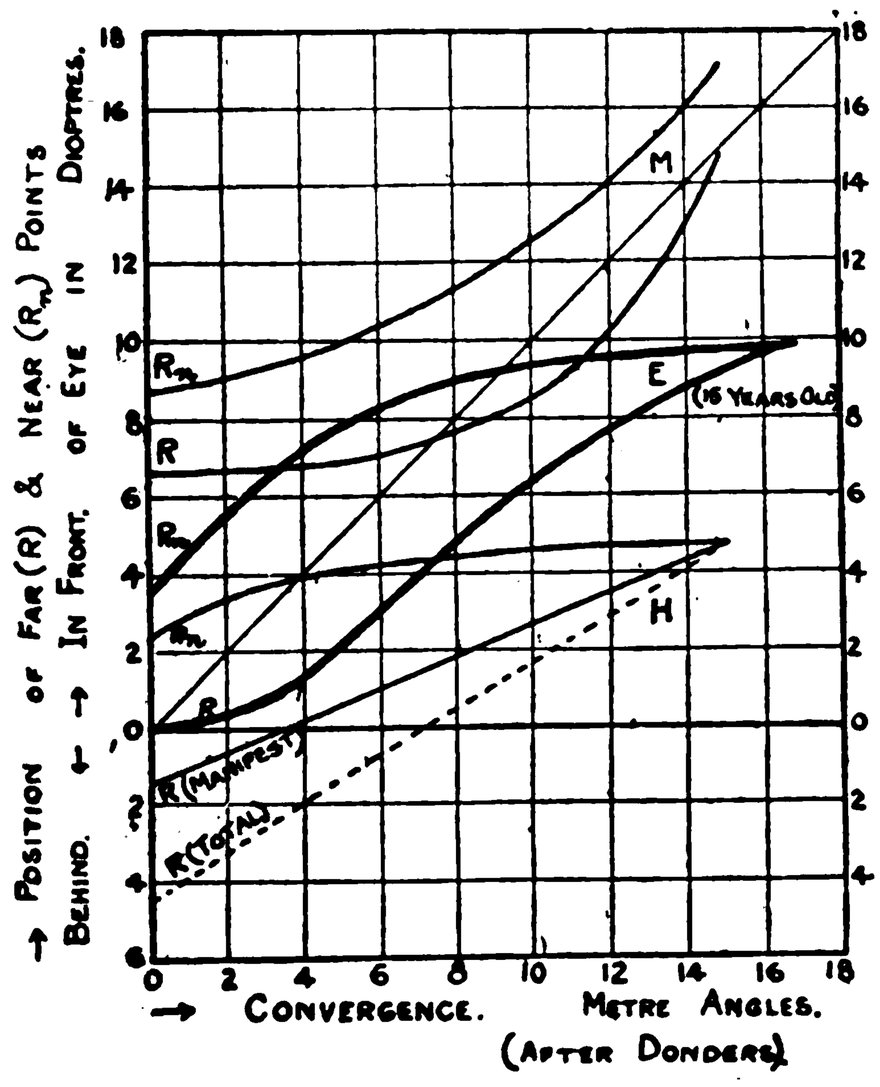


Fig. 14

these tables. The best form types may be obtained adding $(k-1)\frac{M}{1-\delta_2 M}$ to the powers in the equi-bi-convex table, using the nearest equi-bi-power to find k in the chart (fig. 13).

The calculation of the negative lenses is easier since the form factor is only secondary. The correct astigmatic correction for near may be obtained, so also may that lens be chosen which equalises accommodation or as we shall explain in the next article that which equalises the 'demand.' The lens which equates the accommodation to that of the emmetrope irrespective of convergence of the visual axes may also be obtained, *i.e.*, when M = N.

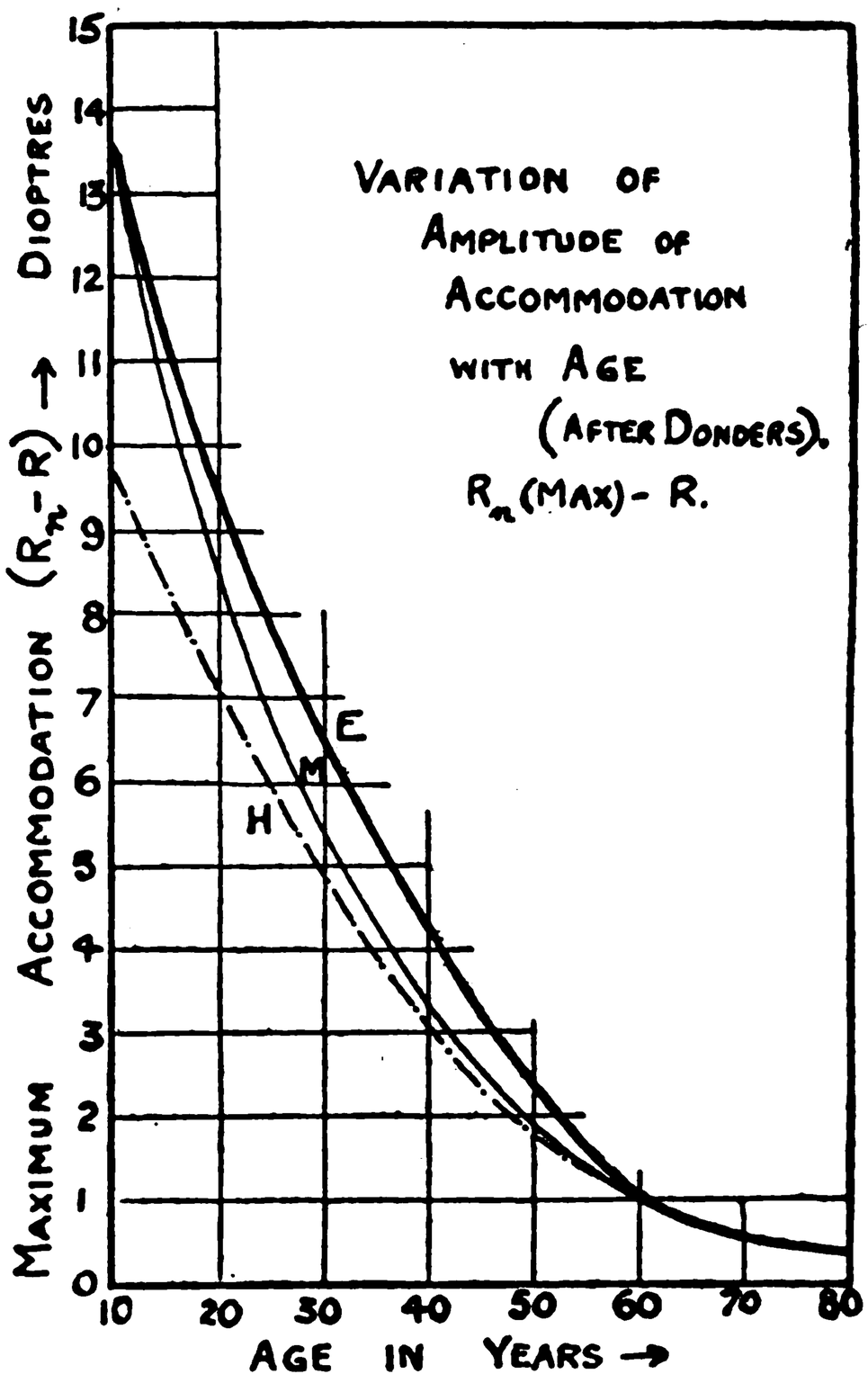


Fig. 15

Thus if it be decided to draw on the accommodation only N when the object is M away, the necessary lens may be readily obtained from the tables and for any form.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

TABLE 1

FOR EYE TO ACCOMMODATE →			SYMMETRICAL LENSES IN HYPERMETROPIA.																			
			0 Dp.				1 Dp.				2 Dp.				3. Dp.				4 Dp.			
			WHEN THE NEAR OBJECT IS, FROM THE EYE:-																			
+ DISTANCE CORRECTN OF:- mm		THE OCULAR REFRACTION IS:-	Dp 1 cms 100	2 50	3 33	4 25	1 100	2 50	3 33	4 25	1 100	2 50	3 33	4 25	1 100	2 50	3 33	4 25	1 100	2 50	3 33	4 25
0·5	12	0·50	1·50	2·55	3·60	4·70	0·50	1·55	2·60	3·70	-0·50	+0·50	+1·60	+2·65	-1·55	-0·55	+0·50	+1·60	-2·65	-1·60	-0·56	+0·55
	14	0·50	·50	·55	·60	·75	·50	·55	·60	·75	·50	·50	·60	·70	·60	·55	·50	·65	·65	·60	·55	·55
	16	0·50	·50	·55	·65	·75	·50	·55	·65	·75	·50	·50	·60	·75	·60	·55	·55	·65	·65	·60	·55	·55
	18	0·51	·50	·60	·65	·80	·50	·60	·65	·80	·50	·50	·60	·75	·60	·55	·55	·70	·65	·60	·55	·60
1	12	1·01	2·00	3·05	4·10	5·20	1·00	2·05	3·10	4·20	+0·00	1·05	2·10	3·20	-1·05	+0·0	+1·05	2·15	-2·10	-1·05	+0·0	1·10
	14	·01	·00	·05	·10	·25	·00	·05	·15	·25	·00	·05	·15	·25	·05	0	·05	·15	·10	·05	0	·10
	16	·01	·00	·05	·15	·30	·05	·10	·15	·30	·00	·05	·15	·25	·05	0	·10	·20	·10	·05	0	·15
	18	·02	·00	·10	·15	·30	·05	·10	·20	·30	·00	·05	·15	·30	·05	0	·10	·25	·10	·05	0	·15
2	12	2·05	3·00	4·05	6·15	6·20	2·05	3·10	4·15	5·25	1·05	2·10	3·15	4·25	+0·05	1·10	2·15	3·25	-1·00	+0·05	+1·10	2·20
	14	·06	·00	·05	·15	·25	·05	·10	·15	·30	·05	·10	·20	·30	·05	·10	·15	·30	·00	·05	·10	·25
	16	·07	·00	·05	·15	·30	·05	·10	·20	·35	·06	·15	·20	·35	·05	·15	·20	·35	·00	·10	·15	·25
	18	·08	·00	·10	·20	·30	·10	·15	·20	·35	·10	·15	·25	·40	·10	·15	·20	·35	0·95	·10	·15	·30
3	12	3·11	4·00	5·05	6·15	7·20	3·05	4·10	5·15	6·25	2·10	3·15	4·20	5·30	1·10	2·15	3·20	4·30	+0·10	1·15	+2·20	3·30
	14	·12	·00	·06	·15	·25	·05	·15	·20	·30	·10	·15	·20	·35	·15	·20	·25	·35	·10	·15	·25	·35
	16	·16	·00	·10	·15	·30	·10	·15	·25	·35	·15	·20	·25	·40	·15	·20	·30	·40	·15	·20	·25	·40
	18	·17	·00	·10	·20	·30	·10	·20	·25	·40	·15	·20	·30	·45	·20	·25	·30	·45	·15	·25	·30	·45
4	12	4·20	5·00	6·06	7·15	8·25	4·10	5·15	6·20	7·30	3·15	4·20	5·25	6·35	2·20	3·25	4·30	5·40	+1·20	2·25	3·30	4·40
	14	·23	·00	·05	·15	·25	·10	·15	·25	·35	·15	·25	·30	·40	·20	·25	·35	·45	·25	·30	·35	·45
	16	·27	·00	·10	·15	·30	·15	·20	·30	·40	·20	·30	·35	·50	·25	·30	·40	·50	·30	·35	·40	·55
	18	·31	·00	·10	·20	·35	·15	·20	·30	·45	·25	·30	·40	·55	·30	·35	·45	·60	·35	·40	·45	·60
5	12	5·33	6·00	7·10	8·15	9·25	5·10	6·15	7·25	8·35	4·20	5·25	6·30	7·40	3·25	4·30	5·40	6·50	2·30	3·35	4·45	5·50
	14	·37	·00	·10	·16	·30	·15	·20	·25	·40	·25	·30	·35	·50	·30	·35	·45	·55	·35	·40	·45	·60
	16	·43	·00	·10	·16	·30	·15	·20	·30	·45	·25	·35	·40	·55	·30	·40	·50	·65	·40	·45	·55	·70
	18	·50	·05	·10	·20	·35	·20	·25	·35	·50	·30	·40	·50	·65	·40	·50	·55	·70	·50	·55	·65	·75
6	12	6·46	7·00	8·10	9·15	10·30	6·15	7·20	8·30	9·40	5·26	6·30	7·35	8·45	4·35	5·40	6·45	7·55	3·40	4·45	5·50	6·60
	14	·58	·00	·10	·20	·30	·15	·25	·30	·45	·30	·35	·45	·55	·40	·45	·55	·65	·45	·55	·60	·70
	16	·63	·00	·10	·20	·35	·20	·25	·35	·50	·30	·40	·45	·60	·45	·50	·60	·75	·55	·60	·65	·80
	18	·72	·05	·10	·20	·35	·20	·30	·40	·55	·40	·45	·55	·70	50	·55	·65	·80	·60	·70	·75	·90
7	12	7·64	8·00	9·10	10·15	11·30	7·15	8·25	9·30	10·42	6·30	7·35	8·40	9·50	5·40	6·45	7·55	8·65	4·50	5·55	6·60	7·70
	14	·76	·00	·10	·20	·30	·20	·25	·35	·45	·36	·40	·50	·60	·50	·55	·60	·75	·60	·65	·70	·95
	16	·88	·00	·10	·20	·35	·20	·30	·35	·50	·40	·50	·55	·70	·55	·60	·70	·85	·65	·75	·80	8·00
	18	8·02	·05	·10	·30	·40	·25	·35	·45	·60	·45	·55	·65	·80	·70	·80	·90	9·05	·75	·85	·90	·05
8	12	8·85	9·05	10·10	11·20	12·30	8·15	9·25	10·35	11·45	7·35	8·40	9·50	10·60	6·45	7·50	8·60	9·70	5·60	6·65	7·75	8·85
	14	9·00	·06	·10	·20	·35	·20	·30	·35	·50	40	·45	·55	·65	·55	·60	·70	·80	·70	·75	·80	·95
	16	·15	·05	·10	·20	·40	·25	·35	·40	·55	45	·50	·60	·75	·60	·70	·80	·90	·80	·85	·90	9·05
	18	·34	·05	·10	·25	·40	·30	·40	·45	·65	50	·60	·70	·85	·70	·80	·90	10·05	·90	7·00	8·10	·25
9	12	10·08	10·05	11·10	12·20	13·30	9·25	10·30	11·40	12·50	8·40	9·45	10·55	11·65	7·55	8·60	9·70	10·80	6·65	7·70	8·80	9·90
	14	·28	·05	·10	·20	·35	·25	·35	·45	·55	45	·55	·60	·75	·60	·70	·80	·90	·80	·85	·90	10·05
	16	·51	·06	·10	·20	·40	·30	·40	·50	·65	55	·60	·70	·85	·70	80	·90	11·00	·90	·95	9·05	·20
	18	·77	·05	·15	·25	·45	·35	·45	·55	·75	60	·70	·80	·95	·85	·95	10·05	·20	7·05	8·15	·25	·40
10	12	11·36	11·05	12·10	13·20	14·35	10·25	11·30	12·45	13·55	9·45	10·50	11·60	12·70	8·60	9·70	10·80	11·90	7·80	8·85	9·95	11·05
	14	·63	·05	·10	·20	·35	·30	·35	·50	·60	50	·60	·70	·80	·70	·80	·90	12·00	·90	9·00	10·05	·20
	16	·90	·05	·15	·25	·40	·30	·40	·55	·65	75	80	·90	13·10	·85	·90	11·00	·15	8·05	·10	·20	·35
	18	12·20	·10	·15	·25	·45	·35	·45	·60	·75	96	11·05	12·15	·35	·95	10·00	·15	·30	·20	·25	·35	·55

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

In Winter Homes as well—



Chance's 'CROOKES' Glass

should be given as great prominence during the short as during the long days. It is as effective against the deleterious effects of artificial light as against excessive sunlight. If any of your clients want protective glass for wearing abroad– on the Mediterranean or in Switzerland—recommend the deeper tint "B" of Chance's "Crookes" Glass, which is intended particularly for such conditions.

CHANCE BROS. & Co., Ltd.,

Glass Works,

Smethwick, Birmingham.



The late Sir Wm. Crookes-O.M., F.R.S., to whose researches was largely due the evolution of Chance's Crookes Glass.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"WERTEX"

WILLMOTTS'

LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.



11c 11c

Satisfy your client by selling him a specimen of your skill, and then gratify him by presenting him with a specimen of ours.

Use "WERTEX" Cases.

Details and samples from your dealer or direct from the manufacturers.

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

ENGLAND.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

TABLE 2

FOR EYE TO ACCOMMODATE →			PLANO-LENSES IN HYPERMETROPIA.																			
			0 Dh				1 Dh				2 Dh				3 Dh				4 Dh			
			WHEN THE NEAR OBJECT IS, FROM THE EYE :-																			
DISTANCE CORRECTN V/12 a/c.		NEUTRALISING OR FRONT. VERTX OF CARDINAL POWER	Dpt. 1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
			cms/100	50	33	25	100	50	33	25	100	50	33	25	100	60	33	25	100	50	33	25
+0·5	12	−0·5	1·50	2·55	3·60	4·75	0·50	1·55	2·60	3·70	−0·50	+0·5	+1·60	+2·75	−1·55	−0·55	+0·50	+1·60	−2·65	−1·60	−0·55	+0·55
	14		·50	·55	·65	·75	·50	·55	·65	·75	·50	·45	·60	·75	·60	·55	·50	·65	·65	·60	·55	·55
	16		·50	·60	·66	·80	·50	·55	·65	·80	·50	·45	·60	·80	·60	·55	·55	·65	·65	·60	·55	·55
	18		·50	·60	·65	·85	·50	·60	·70	·80	·50	·45	·65	·80	·60	·55	·55	·70	·65	·60	·55	·60
1	12	1·0	2·00	3·05	4·15	5·25	1·00	2·05	3·15	4·25	+0·0	1·05	2·12	3·25	−1·05	+0·0	+1·05	2·15	−2·10	−1·05	0·00	1·10
	14		·00	·05	·15	·30	·00	·10	·15	·25	0	·05	·15	·30	·05	0	·05	·20	·10	·05	·00	·10
	16		·00	·10	·15	·30	·05	·10	·15	·30	0	·05	·15	·35	·05	0	·10	·20	·10	·05	·00	·15
	18		·00	·10	·20	·35	·05	·10	·20	·35	0	·05	·16	·35	·05	0	·10	·25	·10	·05	·00	·15
2	12	1·99	3·00	4·05	5·15	6·25	2·05	3·10	4·15	5·30	1·05	2·10	3·15	4·35	+0·05	+1·10	+2·15	3·25	−1·00	+0·05	1·15	2·20
	14		·00	·05	·15	·30	·05	·10	·20	·30	·05	·10	·20	·35	·06	·10	·20	·30	·00	·05	·15	·25
	16		·00	·10	·20	·35	·05	·10	·20	·35	·05	·16	·20	·40	·05	·15	·20	·35	·00	·10	·15	·30
	18		·00	·10	·20	·35	·10	·15	·25	·40	·10	·15	·25	·45	·10	·15	·25	·40	·95	·10	·20	·30
3	12	2·99	4·00	5·10	6·15	7·30	3·05	4·10	5·20	6·30	2·10	3·15	4·20	5·40	+1·10	2·15	3·25	4·35	+0·10	+1·15	2·20	3·30
	14		·00	·10	·15	·30	·05	·16	·20	·35	·10	·15	·25	·45	·15	·20	·25	·40	·10	·15	·25	·35
	16		·00	·10	·20	·35	·10	·15	·25	·40	·15	·20	·30	·50	·15	·20	·25	·45	·10	·20	·30	·40
	18		·00	·10	·20	·35	·10	·20	·30	·45	·15	·20	·30	·55	·20	·25	·35	·50	·15	·25	·30	·45
4	12	3·98	5·00	6·10	7·15	8·30	4·10	5·15	6·25	7·35	3·15	4·20	5·30	6·50	2·20	3·25	4·30	5·45	+1·20	+2·25	3·30	4·45
	14		·00	·10	·20	·35	·10	·20	·25	·40	·15	·25	·30	·55	·20	·30	·35	·50	·25	·30	·35	·50
	16		·00	·10	·20	·40	·15	·20	·30	·50	·20	·30	·35	·60	·25	·30	·40	·55	·30	·35	·40	·55
	18		·05	·10	·25	·40	·15	·25	·35	·50	·25	·30	·40	·65	·30	·35	·45	·60	·35	·40	·45	·65
5	12	4·97	6·05	7·10	8·20	9·35	5·15	6·20	7·30	8·42	4·20	5·25	6·35	7·55	3·25	4·35	5·40	6·55	2·30	3·35	4·45	5·55
	14		·05	·10	·20	·35	·15	·25	·30	·50	·25	·30	·40	·65	·30	·40	·45	·60	·35	·40	·50	·60
	16		·05	·10	·20	·40	·15	·25	·35	·50	·25	·35	·45	·70	·35	·45	·55	·70	·40	·50	·55	·70
	18		·05	·15	·25	·40	·20	·30	·40	·60	·30	·40	·50	·80	·40	·50	·60	·75	·50	·55	·65	·80
6	12	5·94	7·05	8·10	9·20	10·40	6·15	7·25	8·35	9·45	5·25	6·30	7·40	8·65	4·35	5·40	6·50	7·60	3·40	4·50	5·55	6·70
	14		·05	·15	·20	·40	·20	·25	·35	·50	·30	·40	·45	·75	·40	·50	·60	·70	·45	·55	·60	·80
	16		·05	·15	·25	·45	·20	·30	·40	·60	·35	·40	·50	·80	·45	·55	·65	·80	·55	·60	·70	·85
	18		·05	·15	·30	·50	·25	·30	·45	·65	·40	·45	·60	·90	·50	·60	·70	·90	·60	·70	·80	7·00
7	12	6·91	8·05	9·15	10·25	11·40	7·20	8·25	9·40	10·50	6·30	7·35	8·50	9·75	5·40	6·50	7·60	8·70	4·50	5·55	6·65	7·80
	14		·05	·15	·25	·45	·20	·30	·40	·55	·35	·45	·55	·80	·50	·60	·70	·80	·60	·65	·75	·90
	16		·05	·15	·30	·50	·20	·30	·45	·60	·40	·50	·65	·90	·55	·65	·75	·90	·70	·75	·85	8·05
	18		·05	·15	·30	·50	·25	·35	·50	·70	·50	·55	·70	10·00	·70	·80	·95	9·10	·80	·85	·95	·15
8	12	7·86	9·05	10·15	11·30	12·45	8·15	9·30	10·40	11·60	7·35	8·45	9·55	10·85	6·50	7·55	8·70	9·80	5·60	6·70	7·80	8·92
	14		·05	·15	·30	·50	·20	·30	·45	·65	·40	·50	·60	·90	·55	·65	·80	·90	·70	·80	·85	9·05
	16		·05	·15	·30	·50	·25	·35	·50	·70	·45	·55	·65	11·60	·65	·75	·85	10·00	·80	·85	·95	·15
	18		·05	·15	·35	·55	·30	·40	·55	·80	·55	·65	·75	·10	·70	·80	·95	·15	·95	7·00	8·15	·35
9	12	8·81	10·05	11·15	12·30	13·50	9·25	10·35	11·50	12·65	8·40	9·50	10·60	11·90	7·55	8·65	9·75	10·90	6·65	7·75	8·85	10·0
	14		·05	·15	·30	·55	·25	·35	·50	·70	·50	·60	·70	12·00	·65	·75	·90	11·00	·80	·90	9·00	·15
	16		·05	·20	·35	·55	·30	·45	·60	·80	·55	·65	·80	·10	·70	·80	9·95	·15	7·05	·95	9·10	·30
	18		·05	·20	·35	·60	·40	·50	·65	·90	·65	·75	·90	·25	·85	·95	10·10	·30	8·15	9·30	·30	·50
10	12	9·75	11·05	12·20	13·35	14·55	10·30	11·40	12·55	13·70	9·45	10·55	11·70	13·05	8·65	9·75	10·90	12·00	7·80	8·90	10·00	11·15
	14		·05	·20	·35	·55	·30	·45	·60	·80	·55	·65	12·00	·15	·70	·85	11·00	·15	·95	9·00	·15	·30
	16		·10	·20	·35	·60	·35	·45	·65	·85	·65	·85	·25	·40	·85	·95	·15	·30	8·05	·15	·30	·50
	18		·10	·20	·40	·65	·40	·50	·70	·90	10·00	11·10	·25	·65	·95	10·05	·25	·40	·30	·30	·45	·65

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

TABLE 3

FOR EYE TO ACCOMMODATE →	DEEP MENISCUS (−6·0 Dpt BASE) LENSES IN HYPERMETROPIA.																			
	0 Dpt				1 Dpt				2 Dpt				3 Dpt				4 Dpt			
	WHEN THE NEAR OBJECT IS, FROM THE EYE:-																			
DISTANCE OF CONVERGENCE (BACK VERTEX) at:-	Dpt 1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
± Dpt mm	cms 100	50	33	25	100	50	33	25	100	50	33	25	100	50	33	25	100	50	33	25
0·5 — NEUTRALISING LENS POWER D.M. DISTANCE FRONT VERTEX																				
12	1·50	2·60	3·65	4·80	+0·50	1·55	2·65	3·75	−0·53	+0·50	+1·60	+2·75	−1·55	−0·55	+0·50	+1·65	−2·65	−1·60	−0·55	+0·55
14	·50	·60	·70	·85	·30	·60	·65	·80	·55	·50	·60	·75	·60	·55	·50	·65	·66	·60	·55	·55
16	·50	·60	·70	·90	·50	·60	·70	·80	·55	·50	·60	·80	·60	·55	·50	·70	·65	·60	·55	·60
18	·55	·60	·70	·90	·50	·60	·70	·85	·55	·50	·65	·80	·60	·55	·50	·70	·65	·60	·55	·60
1·0 — −0·99																				
12	2·00	3·10	4·20	5·35	1·05	2·10	3·15	4·30	+0·0	1·05	2·15	3·25	−1·05	+0·0	+1·10	2·20	−2·10	−1·05	+0·0	+1·15
14	·00	·10	·20	·35	·05	·10	·15	·35	·0	·10	·15	·30	·05	·0	·10	·20	·10	·05	·0	·15
16	·00	·10	·20	·40	·05	·10	·20	·40	·0	·10	·20	·35	·05	·0	·10	·25	·10	·05	·0	·15
18	·05	·10	·25	·40	·05	·10	·20	·40	·0	·10	·20	·35	·05	·0	·15	·30	·10	·05	·0	·20
2 — −1·97																				
12	3·05	4·10	5·20	6·35	2·05	3·15	4·20	5·35	1·05	2·10	3·20	4·35	+0·05	+1·10	2·20	3·30	−1·00	+0·05	+1·15	2·25
14	·05	·10	·25	·40	·05	·15	·25	·40	·05	·10	·20	·35	·05	·15	·20	·35	·00	·05	·15	·30
16	·05	·10	·25	·45	·06	·15	·25	·45	·10	·15	·25	·40	·05	·15	·25	·40	·00	·10	·15	·30
18	·05	·15	·25	·45	·05	·20	·30	·50	·10	·15	·30	·45	·10	·15	·25	·45	·00	·10	·20	·35
3 — −2·95																				
12	4·05	5·10	6·25	7·40	3·10	4·15	5·25	6·40	2·10	3·15	4·25	5·40	1·15	2·20	3·30	4·40	+0·10	+1·15	2·25	3·40
14	·05	·15	·25	·40	·10	·20	·30	·45	·10	·15	·30	·45	·15	·20	·30	·45	·10	·15	·25	·40
16	·05	·15	·25	·45	·10	·20	·30	·50	·15	·20	·35	·50	·15	·25	·35	·50	·15	·20	·30	·50
18	·05	·15	·30	·50	·10	·25	·35	·55	·15	·25	·35	·55	·20	·25	·40	·55	·15	·25	·35	·55
4 — −3·92																				
12	5·05	6·15	7·25	8·45	4·10	5·20	6·30	7·45	3·15	4·25	5·35	6·50	2·20	3·25	4·35	5·50	1·20	2·30	3·40	4·50
14	·05	·15	·25	·45	·10	·20	·35	·50	·20	·30	·35	·55	·20	·30	·40	·55	·25	·30	·40	·55
16	·05	·15	·30	·50	·15	·25	·40	·60	·20	·35	·40	·65	·25	·35	·45	·65	·30	·35	·50	·65
18	·05	·15	·30	·55	·15	·30	·40	·60	·25	·35	·45	·65	·30	·40	·50	·70	·30	·40	·55	·70
5 — −4·87																				
12	6·05	7·15	8·30	9·50	5·15	6·25	7·35	8·50	4·20	5·30	6·40	7·55	3·30	4·35	5·45	6·65	2·35	3·40	4·50	5·65
14	·05	·15	·30	·50	·20	·25	·40	·60	·25	·35	·45	·65	·35	·40	·50	·70	·35	·45	·55	·70
16	·05	·15	·30	·55	·20	·30	·40	·60	·30	·40	·50	·70	·35	·45	·55	·75	·40	·50	·65	·80
18	·05	·20	·35	·55	·20	·35	·45	·70	·35	·45	·60	·80	·45	·55	·65	·85	·50	·60	·70	·90
6 — −5·81																				
12	7·05	8·15	9·30	10·50	6·20	7·30	8·40	9·60	5·25	6·35	7·45	8·65	4·35	5·45	6·55	7·70	3·45	4·50	5·60	6·75
14	·05	·20	·35	·55	·20	·30	·45	·65	·35	·40	·55	·75	·40	·50	·65	·80	·50	·60	·70	·85
16	·05	·20	·35	·60	·20	·35	·50	·70	·35	·45	·60	·80	·45	·60	·70	·90	·55	·65	·75	·95
18	·05	·20	·35	·60	·25	·35	·55	·75	·40	·50	·65	·90	·50	·65	·75	8·00	·65	·75	·85	7·05
7 — −6·74																				
12	8·05	9·20	10·35	11·60	7·20	8·30	9·45	10·65	6·30	7·40	8·55	9·75	5·45	6·55	7·65	8·80	4·50	5·60	6·70	7·90
14	·05	·20	·35	·60	·20	·35	·50	·70	·35	·50	·60	·80	·50	·60	·75	·95	·60	·70	·85	8·00
16	·05	·20	·40	·65	·25	·35	·55	·75	·45	·55	·70	·90	·55	·75	·80	9·00	·70	·80	·95	·15
18	·05	·20	·40	·70	·30	·40	·60	·80	·50	·60	·75	10·00	·75	·85	8·00	·20	·80	·90	7·05	·25
8 — −7·67																				
12	9·05	10·20	11·40	12·60	8·20	9·35	10·50	11·75	7·40	8·50	9·65	10·85	6·50	7·60	8·75	9·95	5·65	6·75	7·90	9·05
14	·05	·20	·40	65	·25	40	·55	80	·45	·55	·70	·90	·60	·70	·85	10·05	·70	·80	·95	·15
16	·05	·25	·45	·70	·30	·45	·60	·85	·45	·60	·75	11·00	·65	·75	·95	·15	·80	·90	8·05	·25
18	·10	·25	·45	·70	·35	·45	·65	·95	·55	·70	·85	·10	·75	·85	9·05	·25	·95	7·05	·25	·45
9 — −8·58																				
12	10·10	11·25	12·40	13·65	9·30	10·40	11·60	12·80	8·45	9·65	10·70	11·90	7·60	8·70	9·85	11·05	6·70	7·80	8·95	10·15
14	·10	·25	·45	·70	·30	·45	·60	·85	·50	·65	·80	12·00	·65	·80	·95	·15	·85	·95	9·05	·30
16	·10	·25	·45	·75	·35	·50	·70	·95	·60	·70	·90	·10	·75	·90	10·05	·30	·95	8·05	·20	·45
18	·10	·25	·50	·75	·40	·55	·75	13·05	·65	·80	11·00	·25	·90	9·05	·20	·45	7·10	·20	·40	·65
10 — −9·45																				
12	11·10	12·25	13·45	14·75	10·30	11·45	12·70	13·90	9·50	10·65	11·80	13·05	8·65	9·80	11·00	12·20	7·85	8·95	10·10	11·35
14	·10	·25	·45	·80	·35	60	·70	·95	·56	·70	·90	·15	·75	·90	·05	·30	·95	9·10	·25	·50
16	·10	·30	50	·85	·35	65	·75	14·00	·80	·95	12·10	·40	90	10·00	·20	·45	8·10	·20	·40	·65
18	·10	·30	·50	·90	·40	·60	·80	·10	10·00	11·15	·35	·65	9·00	·15	·35	·60	·25	·35	·55	·80

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Your Greatest Asset

IS it not your experience, that the instinctive knowledge which enables you to tackle your more complicated cases, does so with the same precision and certainty of success that attends you when handling the simple ones?

Experience confirms your knowledge, proves your skill, supports your claim to competence. It is the rock on which you build.

We too, build on that same rock. We claim that our century of experience as manufacturing opticians has given us a comprehensive fund of knowledge not to be obtained in any other way. We believe that, those sons and daughters (now in our employ) of the craftsmen, who served this firm in their day have inherited and amplified the skill of their forbears.

We offer you our experience, knowing that it will enable us to give you fullest satisfaction in the most difficult as well as the simplest work you entrust to our hands.

We invite your enquiries.

NEWBOLD & CO.

[P. and S. NEWBOLD PROPRIETORS.]

MANUFACTURING OPTICIANS,

(WHOLESALE.)

72 & 74, Grays Inn Road,

Telegrams:
OMNEWBOLZA,
HOLB. LONDON.

W.C.1

Telephone:
CITY 1642.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

OPTICAL MANUFACTURERS LTD.,

(Incorporating Wheway Optical Co., Ltd.)

WAR TIME CONTRACTORS TO THE ARMY SPECTACLE DEPOT.

Manufacture for the Wholesale Trade:—

Gold and Gold Filled Spectacle and Astig Frames.

Gold and Gold Filled Rimless Spectacle and Finger Piece Mountings

Gold and Gold Filled Monocles and Reading Glasses.

Solid Nickel Spectacle and Astig Frames.

Solid Nickel Pillar Frames and Folding Gauze Spectacles.

Steel Spectacle Frames.

Spectacle Sides and Jobbing Materials, in all Metals.

Extract from a letter received from Australia:

"We are delighted with the goods just supplied and if you can only keep the prices right and maintain the same quality, you may rely upon getting all our business."

All these Articles are of **English Manufacture**

Works at VYSE STREET and GEM BUILDINGS, HOCKLEY HILL, BIRMINGHAM.

London Office: 55, HATTON GARDEN, E.C.1.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Various methods exist of deciding on the near work lens, particularly in presbyopia in which there is a deficiency of accommodative resources, each method being proclaimed by its author or supporters as passing satisfactorily the crucial test of experience. We will begin with Donders' weighty remarks on the subject.

In fig. 14 is represented the variation in the position of far and near points in binocular vision with the degree of convergence of the visual axes. They are based on averages, the dark curve E corresponding with that which obtains in a young fifteen year-old emmetrope. The curves M and H refer respectively to myopia and hypermetropia. In the former, for example, the far point R as is to be expected lies in front of the eye, the static ocular refraction is 6.75 Dp. (when the convergence of the visual axes is zero). In hypermetropia we have the additional complication of measuring the total and manifest quantities. If the static defects then be corrected by a distance correction so that R and R'' become imaged now by the distance correcting lens, it will be evident that the state of affairs does not coincide with the emmetropic state. Regarding this Donders states:

"Dissimilarity in the conformation of the lines is the consequence of practice. Myopes habituate themselves to accommodate but feebly with slight degrees of convergence whereas hypermetropes under similar conditions accommodate very forcibly. By the continual employment of corrective spectacles, the shapes of the lines more nearly approach those of emmetropes; even a brief use of spectacles will have a similar influence." . . "Each ametropic case should not be at once entirely neutralised."

The above statements of Donders are not quoted so frequently in text books as the following:

"The accommodation can only be maintained for a length of time for a distance at which the positive part of the relative range of accommodation is not too small in comparison with the negative portion" (see Dr. Sheard, *The Optician*, Jan. 20, 1922, p. 331). By the positive portion is understood that portion of R_n which lies above the straight diagonal line connecting equal convergences and accommodations.

It must be remembered that in practice the eye with its distance correction will only be exerting accommodations and convergences in the neighbourhood of from two to four dioptres and meter-angles respectively. The optometer which Donders employed to obtain these results fixed lenses at a constant distance from the anterior principal point of the eye whilst he allowed for the necessary effectivity modification due to the forward position of the lenses he employed.

Fig. 15 reproduces Donders' average results showing the rate of diminution of accommodative resources and shows that presbyopia affects hypermetropia, myopia and emmetropia on the average to practically equal extents.

This work of Donders has considerably influenced the practice of adapting spectacles for near work and the existing methods of measuring the maximum amplitude of accommodation in routine testing most probably owes its inception to Donders. Experience has shown that the presbyope is comfortably corrected if a presbyopic addition is made which leaves one half (Laurance) or one third (Dr. H. Walker, *The Optician*, May 20, 1921, p. 176) of his resources in reserve.

These methods of estimating the near correction thus leave many possibilities to chance and hence the American tendency to rely on an objective method of dynamic skiametry, *i.e.*, to refract the accommodated eye by retinoscopy, arises. The writer's practical acquaintance with this method is confessedly small but as far as he reads in the matter there are loopholes here also. The fact that it is a direct substitution method is a good step.

Whatever the method of refracting near work, it is hoped that the tables here given will possess a positive value in the interpretation of the general results of near vision testing.

The Annual General Meeting of the British Optical Association is to be held at 2.30 p.m., on Wednesday, February 22nd., at Clifford's Inn Hall, Fleet Street. There will be a dinner in the evening, followed by a dance at the Waldorf Hotel.

The death is announced of Mr. Robert Gordon Orr, Honorary Treasurer of the British Optical Association. Mr. Orr, who was 80 years of age, died on Sunday last, after a brief attack of influenza and bronchitis, and has been interred at East Finchley. A Commemoration Service will be held at the Catholic Apostolic Church, Duncan Street, Islington, at 11.30 a.m. on Wednesday, the 8th inst.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Vertex Numbering and the True Problem of Equivalence.

By E. MAYER (Paris).

"The writer's contention is that lenses required for near vision should give the same amplitude of accommodation as that enjoyed by the true emmetrope, be he young or old. Equality of amplitude of accommodation is, to my mind, the condition of near equivalence."

This is an extract from a paper recently written by Mr. William Swaine ("Spectacles and Near Vision," *The Optician*, No. 1608), in which the author gives the condition of near equivalence and imagines a method of fulfilling this condition with vertex numbered lenses. The article ends as follows:

"If my reasoning be at fault, or excessively controversial, I would be glad to receive criticism."

Availing of this invitation, I intend to refute Mr. Swaine's method as regards not only misuse of words but also the true problem of equivalence.

Amplitude of accommodation is the maximum power of the eye to get the same result as addition of plus power lenses. Anybody initiated in physiologic optics knows that this power lies in the eye, not in lenses. It is secured by action of the ciliary muscle and remains unchanged by wearing a glass. If, for instance, a young man has an amplitude of 8^d00, he can add at will this said power o any inferior power either to his naked eye or to his eye wearing a -2.00 lens. Lenses required for near vision do not give any amplitude but merely alleviate the function of accommodation so as to displace the conjugate focus of retina. On the other hand, it is a fact beyond dispute that a young emmetrope is less in need of alleviation for near work than an old hypermetrope. Mr. William Swaine is the only author that mistakes amplitude for alleviation and true emmetropia for corrected ametropia. Let us assume he said in his contention:

"Lenses required for near vision should give the same alleviation to the same patient, be he young or old but rendered ametropic by correcting lenses."

This contention is a right one. I am happy to agree with Mr. William Swaine, so much so as this pleasure is unusual. But we differ in appreciation about his method of applying this condition.

In advocating the vertex numbering for near vision, he now changes his method of securing equivalence according to the condition to be fulfilled he renders his patient emmetropic by having him wear his distance corrections and he puts before him as much plus power as is needed to alleviate accommodation comfortably. Then he writes his prescription by adding to the vertex powers of distance corrections the extra plus powers he found suitable.

Although he did not explain this procedure as fully as above (and it cannot be understood in another way) he supposes that glasses delivered upon his prescription give the same alleviation to accommodation as do the extra plus lenses over corrected ametropia. Were this supposition true, the conjugate focus of retina would be the same in both cases for a same dynamic state. Mr. William Swaine could then rightly declare that he has solved at last the true problem of equivalence for near work. Unfortunately, this is not the case.

True it is that the power of a combination of thin lenses put in contact is equal to the algebraic sum of their powers. Yes, but only in cardinal system. If is not so and never can be so with *vertex powers* and especially with deep meniscus lenses. Here lies the failure of Mr. Swaine's method. In my opinion, it is worse than the direct test with a vertex trial case as advocated in his former papers.

He will become aware of his prescription being wrong by making the calculations involved in the following example:

Distance corrections: $V_{12} = -20{,}00$. Test found suitable with these corrections on and extra $+2{,}00$ lenses for an object vergence of 4.00. Prescription written -18.00. Glasses delivered accordingly.

The patient must exert more than 1.00 of accommodation to compensate for error of addition. If he is 60 years old, he will surely reject the glasses and complain they are not equivalent to the combination tried during the test. This misfitting is not the fault of the optician but of Mr. Swaine's mistake.

In the examples given on page 333, lenses are chosen so that "the young patient could easily accommodate the amounts or alter the position of the object to compensate." I ack-

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

W.H.T.

GOLD

LORGNETTES

RX WORK

ASTIGS

G. F.

SERVICE

W.H.T.

SUPPLIES

NICKEL

EFFICIENCY

FRAMES

STEEL

MOUNTINGS

WALTER H. THOMPSON

66 HATTON GARDEN, LONDON, E.C. 1.

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE Optical Pioneer of Scotland

We claim to be the First in Scotland to Institute an Efficient Rx SERVICE, the steady growth of which is ample evidence our efforts have been appreciated.

To meet our ever increasing clientele and insure Prompt and Efficient Service, we have just Completed Alterations and Improvements in our Workshops and Rx Departments and Invite your Enquiries.

Rx PRICE LIST ON APPLICATION.

Practically all Work Returned Same Day as Received.

The "Midg-Shur-Stop" Auto Eyeglass Chain

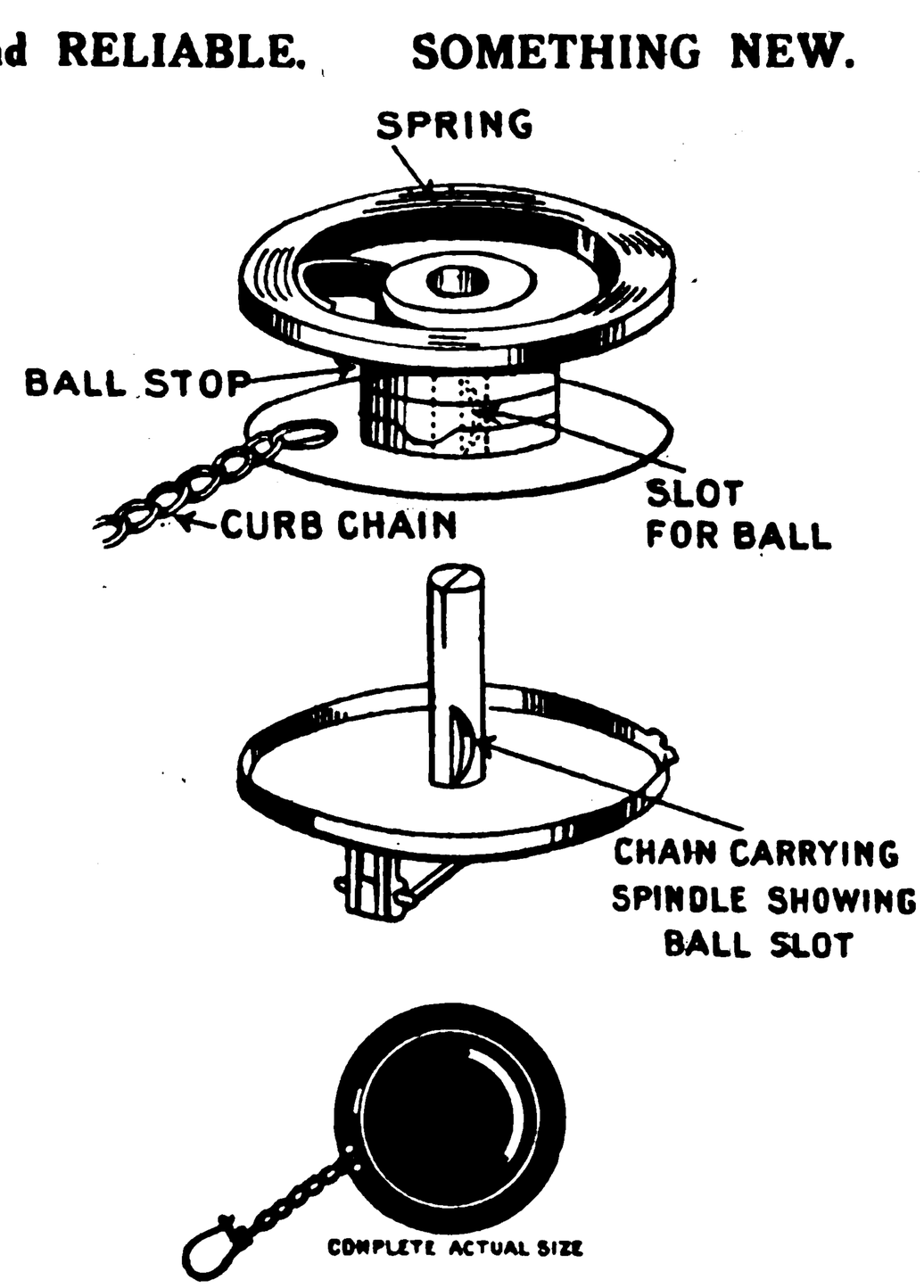
SIMPLE and RELIABLE. **SOMETHING NEW.** **MODERATE IN PRICE.**

The Working Parts as shown consist of Spring, Ball Stop and Slot.

THE ONLY Auto Chain on the Market which can be used with a CURB CHAIN.

Can be stopped instantly at any length of the Chain.

Nothing to get Out of Order.



Made & Stocked in the following patterns:

Polished Jap. Front Oxid Chain
" " " Gilt "
Dull " " Oxid "
Oxid " " " "
" " " Gilt "
Gold Plated Bright Front Gilt "
" " Matt " "
Antique Silver Front Silver "
Rolled Gold Bright Front R.G. "
" " Matt " "
Silvered Gilt Enamelled Fronts Silvered Chains.

Samples of any of above sent on approval on receipt of enquiries.

JOHN BAIRD,
Manufacturing Optician,
Telegrams: "SPECTACLES, GLASGOW."

"HERALD" OPTICAL WORKS,
68 & 70, MITCHELL ST., GLASGOW.
Telephone: CENTRAL 541.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

nowledge that in these cases equivalence is obtained. I never denied such occurrences. My only contention was, and is still, that in extreme cases the patient may feel dissatisfied with deep meniscus lenses although they are rightly made according to vertex prescription.

Perhaps it would be better to make the near test with a special vertex trial case computed for an object vergence of 4.00. This trial case may be made use of also for a vergence of 3.00 or even 2.00 without serious errors. The smaller vergences of 1.00 or 0.50 may be fitted with the ordinary vertex trial case. The goal to satisfy patients by this procedure cannot be denied, but I do not think it is the best device. Anyhow, Mr. Swaine is better qualified than I to help manufacturers in establishing such a special trial case.

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

Workshop Risks.

Sir,—We have just had a young lady employee get her hair entangled in the spindle of an ordinary hand edging machine, a mishap that we should have thought impossible, and the consequences of which might have been very serious.

In view of this, in the interests of all concerned, employers and employees, we would strongly urge that all wheels, spindles and belts should be protected by shields, even on such a simple machine as hand edger or drill.

PREVENTION.

Sir,—If the "sight-testing" of an individual in Ballymuk, who is not a qualified optician, and who has been using a trial case about twelve months, and whose optical business is less than one-tenth of his total; is worth five shillings; how much is the testing worth of an exclusively sight-testing (qualified) optician; established in the centre of a large town, who does fifty tests per week and who has been at it twenty years—a man who has spent thousands of pounds in perfecting his knowledge and educating the public?

Perhaps the Secretary of the N.I.B.S. will answer; but if he does not care to, I have provided an excuse in my signature.

I do not think there is likely to be any great rush on the part of qualified opticians to place themselves on the same level as our imaginary friend in Ballymuk.

INCOG.

The Proposed Optical Panel.

Sir,—In *The Optician* of January 20th, you timely and rightly state that the panel question is a matter of grave account to the ophthalmic optician. As this question concerns every legitimate optician, it behoves us to take it very seriously, and if possible to come to a unanimous opinion concerning it. Unfortunately, the times find us badly organised, opticians up and down the country are isolated and many of them not connected with any society or association. We see in *The Optician* the secretaries of the N.I.B.S. negotiating with different societies and even direct with opticians themselves. This should not be; members should loyally support their society, and be guided accordingly. In division there is chaos and surrender. Taking the collective body of opticians in Great Britain there should be two official societies or councils—one to control the professional side, such as examinations, registrations, etc.; the other to control the commercial side, such as business, panel system, prices, hours ,etc. This would mean an amalgamation of the present existing societies, associations and institutions. In that amalgamation would lie our strength; and our just claims would be listened to with respect inside or outside Parliament.

In 1911, the National Health Insurance authorities in negotiating with the medical profession found them fully organised, so that their claims were readily agreed to, which allowed the doctors a fair remuneration for services rendered. On the other hand the N.H.I. found the drug trade badly organised, given over to keen competition and cutting of prices. The N.H.I. took them at their own valuation. The price lists of cutting chemists were taken as a basis, offered and accepted by the majority with the expectation that it would lead to new business and prescription trade. To-day the same prices obtained in 1912 practically rule with no hope of further increase.

Now let us examine this new scheme which is presented to us. The offer of fees for professional service is right and proper and

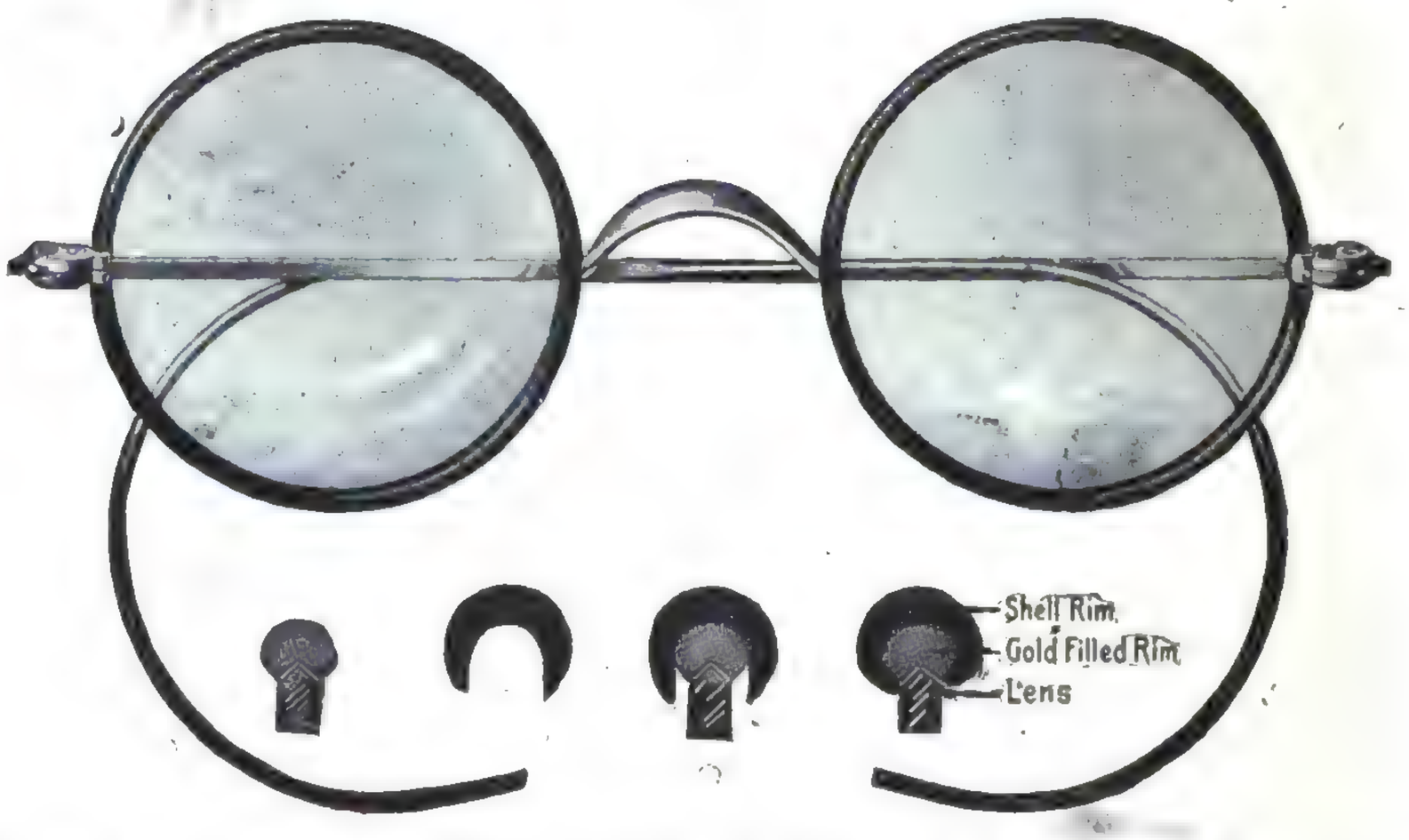
Digitized by Google

Original from THE OHIO STATE UNIVERSITY

DUPAUL, YOUNG OPTICAL CO.,

SOUTHBRIDGE, MASS., U.S.A.

The "ONLIWON" GOLD FILLED INNER RIM ZYLO FRAME.



WE claim we have the ONLY ONE of this class of frame that is scientifically and mechanically perfect in construction.

The most important feature of the "ONLIWON" FRAMES is, the way outer Zylo rim is drawn and closed over the gold filled inner metal rim by a mechanical process known as "crimping," which means curling, turning, drawing, pressing, squeezing. Burnishing one over the other by heat and pressure, thus firmly clamping it securely to the now imbedded inner metal rim, without screws, rivets or clamps.

"ONLIWON" Frames can be formed to any desired shape of eye without the two rims separating.

"ONLIWON" Frames have thin, inconspicuous rims and are not clumsy or showy.

All our Bridges have a Rounded Base at Shank.

Which absolutely prevents the Breaking or cracking of the gold shell of the filled metal during the process of shaping them to size, which is distinctly a Dupaul, Young Optical Company feature on all our frames.

The special KANTFEEL TEMPLES used on "ONLIWON" FRAMES are so made as to almost totally eliminate their breaking at the end-piece.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"BISHOP EYEGLASS CHAINS"

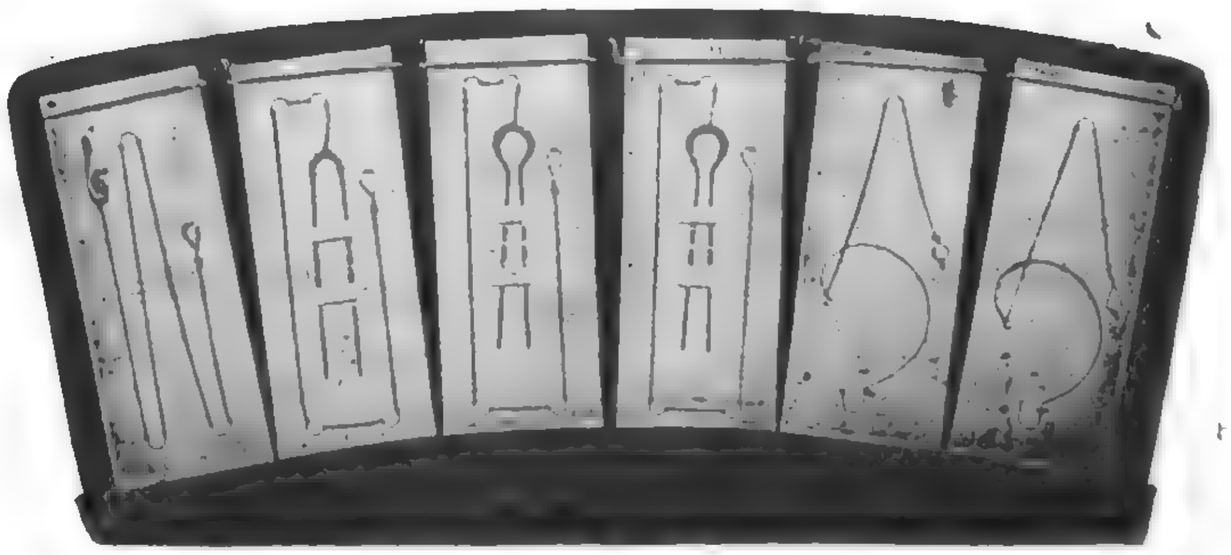
In Gold and Gold Filled

ALSO

SILK EYEGLASS & MONOCLE RIBBONS

are well known to the OPTICAL TRADE and have always been known to give satisfaction. Quality and Finish are evident in all goods of Bishop manufacture and the Bishop trade mark on all chain cards and boxes is your guarantee of absolutely dependancy.

Avoid substitutes, let "BISHOP CHAINS" be your standard of Quality.



THE BISHOP COMPANY,
North Attleboro, Mass.,
U.S.A.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

should secure the services of competent sight-testing opticians. Whether the fees are adequate or not I will leave your readers to judge. The demand to supply glasses at *cost price* is not business and means charity, as I do not known any firm or concern in the country that does business on that basis. As I have already taken up too much of your valuable space I will conclude by asking your readers to get a copy of the terms offered to the dentists and compare notes with those offered to us, and if that does not open their eyes they are still sleeping.

MACK.

Sir,—Are the N.I.B.S. and those submitting schemes for this insurance business aware that these insured people in question are the main support to many opticians established in small populous industrial towns and suburbs? Any scheme agreed upon which is likely to take away the livelihood of such opticians by diverting their patrons into channels which already have an assured clientele of uninsurable patrons will not do. It is regrettable to see the extreme selfishness predominating in recently published proposals by organisations of such repute.

UNORGANISED AND NON-DIPLOMA HOLDER.

Opto-Technical Handbooks.

Sir,—I have read in your leading article that there appears to be a scarcity of books on scientific instruments, and I also read a letter on page 322 complaining of a difficulty in obtaining similar books.

I have a copy of "The Microscope and its Revelations," by Dr. Carpenter, M.D., F.R.S. It is illustrated by 25 plates, and 449 engravings, beautifully bound in cloth, 848 pages; and as I expect to be travelling to England and the Continent in the near future and am selling the greater part of my book collection I shall be pleased to give this to anybody who requires it at a reasonable price or to any school or lecturer free. The book cost 15s. some years ago, and is still practically new.

TIMOTHY O'CONNOR.
Member of the National Association of Opticians.
340, Newtownards Road, Belfast.

NOTICE TO ADVERTISERS.—Change of Copy, for display advertisements, must reach us at latest by post on Tuesday morning preceding publication; and for Cover on Monday. Failing any such notification of change, the last previous copy will be re-inserted.

A Joint Council of Opticians.

We have been favoured by the British Optical Association with advanced proofs of the 'Dioptric Bulletin' about to be issued to their members, and with permission to publish the information contained in it to our readers. The leading article deals with "Spectacles for Insured Persons," and records steps which carry a stage further the proceedings of the Institute of Ophthalmic Opticians and the British Optical Association in connection with the proposed panel of opticians. We reproduce the article below. The opinions expressed in it are of course stated on behalf of the British Optical Association.

"We published in the December number formal reports of the various Conferences upon this subject between the I.O.O. and the B.O.A. These Conferences have now finally terminated in an entirely new body nominated by the two Councils of the British Optical Association, and the Institute of Ophthalmic Opticians. This new body is called the 'Joint Council of Qualified Opticians,' and may be referred to briefly as 'J.C.Q.O.'

"The 'J.C.Q.O.' have for Chairman, Mr. Dadd, F.S.M.C., and for Treasurer, Mr. F. W. Bateman, F.S.M.C., with Mr. Truscott, F.S.M.C., as a member, all of and nominated by the I.O.O. Council with full power to act and negotiate on this question. Mr. G. W. Milner, F.B.O.A., Mr. J. Harwood, F.B.O.A., with Mr. O. Aves, F.B.O.A. (as Minute Secretary), are all of and appointed by the B.O.A. Council with similar powers for action. Mr. J. H. Sutcliffe has been appointed by the 'J.C.Q.O.' (with the prior approval of both the I.O.O. and B.O.A. Councils) to act as 'Director of Administration.'

"We understand the 'J.C.Q.O.' has already met four times, and will very shortly issue a scheme which they think will meet with the approval of the Approved Societies, and also of qualified opticians.

"There is no need for any qualified optician to become 'panicky' over the recent letters of Messrs. Rockliff and Canter. The qualified opticians of the United Kingdom are quite well organised enough to manage their own affairs without any assistance from these two insurance gentlemen. There is no need for hurry. But there is a need—a strong need—for loyalty on the part of qualified opticians.

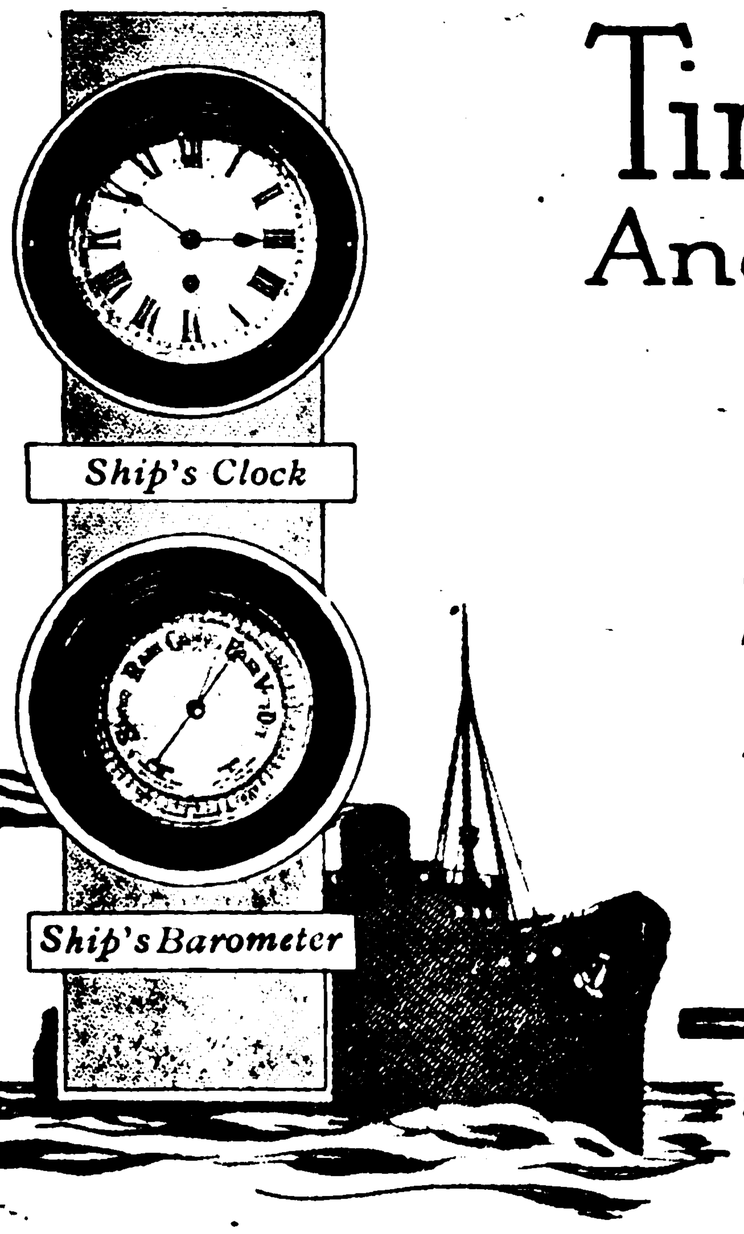
"Here and there, as is the case of all communities, there may be an optician who believes that bankruptcy stares him in the face if he does not clutch wildly at any scheme like

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

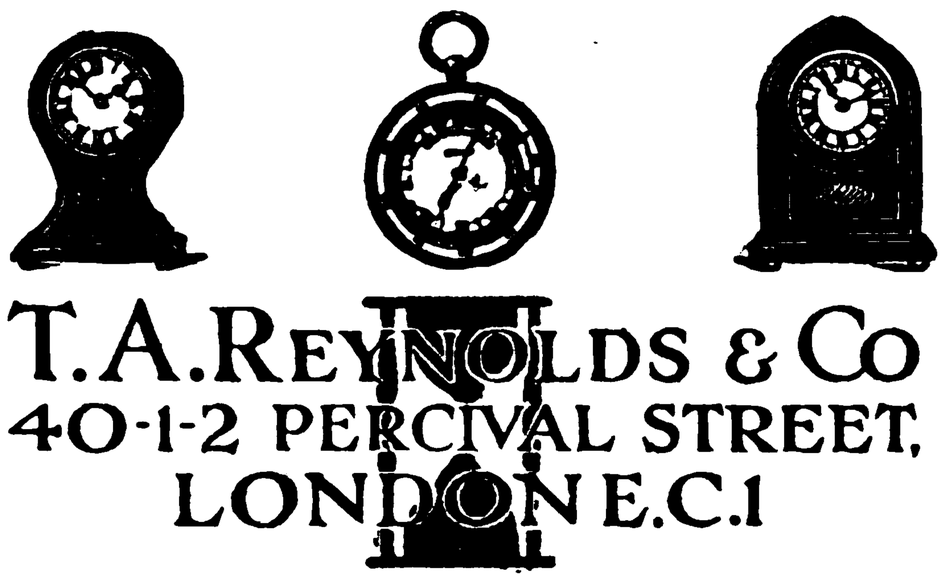
T. A. R. & Co.

"THE ALL BRITISH HOUSE."

Over 2,000 Designs in Aneroid Barometers.



Time and Tide
And Ship's Instruments



T.A.REYNOLDS & CO
40-1-2 PERCIVAL STREET,
LONDON E.C.1



Steam-pipe Thermometer *Hydrometer*

Telegrams—
"THERBAROME. LONDON."

Telephone—
339 CITY.

Showrooms and Offices at above address.

If you are a Retailer and need ORIGINAL LINES in Barometers, Clocks and Thermometers, write us, and although we will not supply you direct, we will put you in touch with the Nearest Wholesale House.

WHOLESALE AND SHIPPING TRADE ONLY.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

What builds up your Rx turnover if not the character of your service and the quality of the eyeglasses you supply?

Your training and experience enable you correctly to diagnose eye-defects and prescribe properly adjusted glasses. This ability is naturally the corner-stone in the structure of your business.

But hardly less important is the accurate interpretation of your Prescriptions. Indeed, without full and absolute confidence in the firm handling this part of your work, your personal skill is likely to be nullified entirely.

Your can place complete trust in the L.O.C. Service.

As far as human foresight, technical skill, and mechanical facilities can ensure it, we have provided against every untoward emergency likely to impair our customers' interests.

Telephone: MUSEUM 4572

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rueide la Pepiniere, Paris. France.

Also at—2, Str-Barsei, Bucharest, Roumania.

Telegrams: Locoptical Kincross London.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

that of the 'N.I.B.S.' We cannot help that type of man. We shall have to put up with him, and trust that any evil effects of his disloyalty to his fellow-opticians will not become too apparent.

"We have just read a letter of Mr. Canter, one of the two secretaries of the 'N.I.B.S.,' in last week's *Optician*, in which he discusses the iniquities of Mr. J. H. Sutcliffe, and in a very minor degree, those of Mr. J. H. Cuff. Apparently his chief trouble lies in the report of what followed a meeting between Mr. Canter, Mr. Sutcliffe and Mr. Cuff. As far as we can gather each one of these three gentlemen left that meeting with quite different impressions of what really happened, and under these very peculiar circumstances it is perhaps as well if the meeting were forgotten, because it would be a very difficult matter to agree upon one similar version.

"There is, however, one thing quite certain which stands out from all the discussion, conferences and meetings; that is that the attitude of the B.O.A. Council and its Secretary has consistently, right throughout, been very strongly opposed to the suggestions, made by Messrs. Rockliff and Canter, as being undignified, unprofitable, and, what is most important, not likely to result in good service for the spectacle-wearing public. About this point there is no mistake, and the members of the B.O.A. Council and its Secretary have never hesitated on every possible opportunity to give voice, most emphatically, on this point. If, after hearing these gentlemen give their opinions, there should be anyone who should come to the conclusion that at any time the B.O.A. Council and its Secretary have held any other opinions, then we have no hope for them or their intelligence.

"We think that the new 'J.C.Q.O.' is going to do good work. It has fixed very representative members from the two Societies, and as far as we can ascertain, has the almost unqualified support of the two Societies. If, with experienced officials we cannot make headway, then the matter had better be shelved altogether. But we are confident that something profitable to all concerned will result. The one trouble and only trouble is what we have mentioned before in that there may be here and there, some qualified opticians who are in a hurry and cannot wait, and must accede to any terms that are put up to them that moment. Any scheme must, first of all, meet with the approval of the National Health Authorities, and then of the Insurance Societies. After that, of the opticians themselves, so that all that will take a little time. We must be a little lenient, when we remember that even the present unsatisfactory scheme of the two gentlemen mentioned above has taken five months to mature; it will take at least a month for another similar scheme to mature."

Recent Optical Patents.

Complete Specifications Published.

1915.

6977. Henderson, Telescopes or cameras for use on board ships, aeroplanes, or other oscillating bodies.

16669. Henderson, Sighting devices.

1916.

168918. Henderson, Distant control of telescopes or cameras.

1920.

144673. Signal Ges., Sound producers and receivers.

146215. Oesterreichisch-Ungarische Optische Anstalt C.P. Goerz Akt-Ges,. Panorama telescopes.

147934. Signal Ges., Receiving-device for subaqueous sound signals.

147939. Signal Ges., Submarine sound transmitting and receiving apparatus.

147942. Signal Ges., Submarine sound producer.

147943. Signal Ges., Device for preventing disturbing noises in polarised electro-magnetic sound apparatus.

147948. Signal Ges., Arrangement for avoiding disturbing noises in listening devices caused by changing circuits associated therewith.

148424. Signal Ges., Sound receivers.

148426. Signal Ges., Sound apparatus.

148427. Signal Ges., Sound signalling device for dense propagating mediums.

148967. Ges. Für Nautische Instrument, Gyroscopic compass.

150705. Costovici, Apparatus for drawing circles.

158538. Perfektone Corporation, Sound-reproducing machines.

168923. Taylor, Optical lens systems.

169010. Kulus, Apparatus for use in photographic reproduction.

169057. Clark & Hartley, Vibrating diaphrams for use in sound instruments.

169067. Crawshaw, Grinding and polishing machine.

169104. Zeal & Burden, Cases for clinical thermometers.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Messrs. Fleming's Branch in Birmingham

For some time past Messrs. J. & R. Fleming, Ltd., have held a controlling interest in Walter Braham & Co., of Birmingham, and they have thought it advisable to change the title of the firm to J. & R. Fleming (Birmingham), Ltd.

With this change one of the oldest names in the optical trade vanishes, the firm of Braham having been established in Bristol in the year 1760, Mr. Walter Braham being, therefore, the fourth generation to succeed to the business. Mr. John Braham, of Bristol, was an exhibitor and obtained a gold medal at the great Exhibition of 1851. He was also the patentee and manufacturer of the pantoscopic frame, which was known throughout the early days of the optical trade as Braham's patent pantoscopic.

The speciality of this firm has always been high-class spectacle frames, and they are still able to place upon the market some of the very best examples of hand-made frames. They also take particular pride in their ability to turn out the highest class of special and prescription work and they consider themselves second to none in this department of their business. The late proprietor of the firm, Mr. Walter Braham, was particularly proud of the number of testimonials he received from friendly customers in the trade testifying to the quality of his work and the attention he gave to same. The retail trade can be assured that they are still able and willing to demonstrate that they possess the ability to give every satisfaction to their customers.

It is now three years since Mr. Walter Braham sold a controlling interest to Messrs. J. & R. Fleming, Ltd., to ease his responsibilities on account of health. His many friends will be glad to know his health is much improved, and his genial personality is still to be found at 6, Key Hill Drive.

The Optical Society.

The annual general meeting of the Optical Society, for the presentation of reports and accounts for the year 1921 and for the election of Officers and Council for the coming year, will be held at the Imperial College of Science and Technology, at 7.30 p.m., on Thursday, the 9th inst. Immediately after the annual general meeting an ordinary meeting will be held, when the following communications will be presented and discussed: "The Structure of Abraded Glass Surfaces," by F. W. Preston, B.Sc. (Messrs. Taylor, Taylor & Hobson, Ltd.). "The Stress Conditions Surrounding a Diamond cut in Glass," by A. J. Dalladay, A.Inst.P., and F. Twyman, F.Inst.P. A supplementary note on "Achromatic One Radius Doublet Eyepieces," by Lt.-Col. J. W. Gifford, F.R.A.S. Note on "Change in Refractive Index at the Surfaces of Glass Melts," by F. Twyman, F.Inst.P., and A. J. Dalladay, A.Inst.P. A limited number of advance proofs of these papers will be available before the meeting. Application for copies to be addressed to the Joint Hon. Secretary, at 12, Oppidans Road, N.W.3.

Employees of Messrs. Willmotts, Ltd.—Social Evening.

On Friday, the 20th January, Messrs. Willmotts, Ltd., Optical Case Manufacturers of Evesham, Worcestershire, gave their Third Annual Supper to their staff and employees. In the course of his remarks the Managing Director—Mr. J. Willmott—referred to the cordial relationship existing between the firm and their employees, and said it was only by this means that commerce could hope to survive the world crisis in which they found themselves at present.

The Town Hall had been engaged for the occasion, and over 120 persons were present. The Social Club, run by the employees of the company had arranged a Whist Drive and Dance to follow, and a very enjoyable evening was spent.

German Goods in Cuba.

According to a report by the Canadian Trade Commissioner at Havana, quoted in the 'Chamber of Commerce Journal,' there has been no real invasion of Cuba by German goods, and the principal reason given in explanation is that Cuba is not at present buying. Investigations, however, in the retail area of Havana disclose a fair number of German products, which have entered the country in driblets, and there are a number of German importing houses which are well established. A great variety of German goods are found among the street hawkers. There is a clinical thermometer which retails at 20 cents, a 25 cent compass which, however, does not know its way about very well, and there are some quite good pencils, if one can persuade them to unfold, and many toys and notions in which the German manufacturer, as usual, excels himself. Glue, however, is used much too freely for a land of heat and insects. It is in such lines as the foregoing that the Germans are doing a very respectable

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

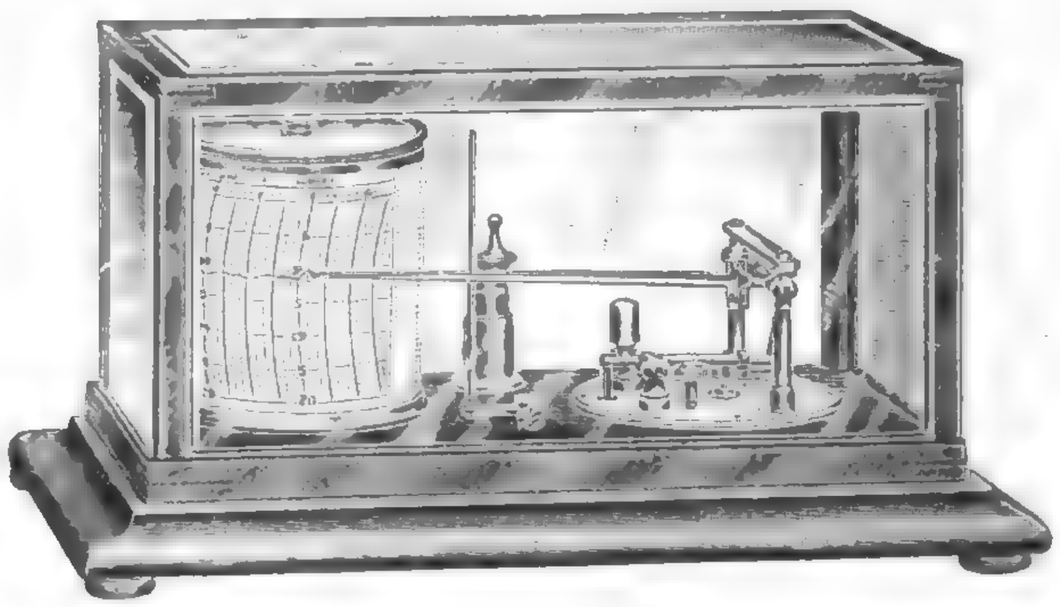
A POPULAR BAROGRAPH

of S. & M. Quality.

This first-class Recording Barometer combines an unusually high degree of accuracy with very moderate price. The Vacuum movement is concealed beneath the base plate, the whole construction being typically "S. & M." in quality and reliability. Available for prompt delivery, either in oak or mahogany case with glass cover, eight day clock and one year's supply of ink and charts.

The world-wide reputation of "S. & M." Scientific Instruments entails no penalty to the Retailer. Every sale shows a handsome profit.

Write for full particulars, terms and general booklet.



S. & M. No. 2318.

SHORT & MASON, Ltd., Aneroid Works, Walthamstow, London, E.17

UNCUT LENSES

OF EVERY DESCRIPTION

QUALITY AND PRICES DEFY COMPETITION

WRITE FOR OUR

LATEST PRICE LIST

OUR RX DEPARTMENT IS UNEQUALLED FOR

PROMPTNESS & ACCURACY

Telephone: HOLBORN 1620 (Private Exchange).

KIRK BROTHERS

WHOLESALE & MANUFACTURING OPTICIANS

Telegrams: KIRBROREX, HOLB. LONDON.

36, GRAY'S INN ROAD, LONDON, W.C.1

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

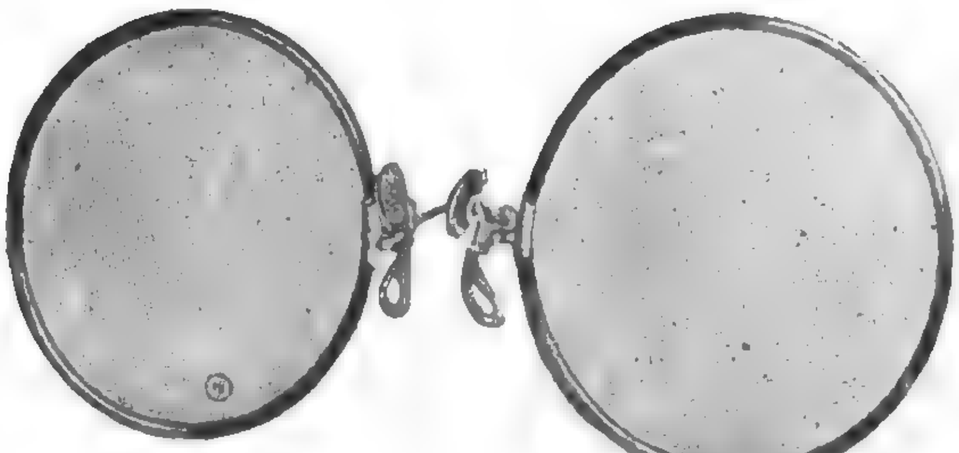
"Promises will win friends, but non-performance will turn them into enemies"

REALFIT FINGER PIECE MOUNTINGS AND FRAMES make friends and keep them because they surpass the promises we make for them. In performance they meet every requirement of the wearer.

Realfit Finger Pieces are the first word in beauty and the last word in comfort. Down to the minutest detail they personify the skill of expert craftsmen.

From A to Z—the Realfit is constructed with jeweler's precision. The metal is 1/10-12 ct. throughout. Made in all standard sizes with a complete assortment of guards. When you think of Finger Pieces—think of Realfit.

NEW JERSEY OPTICAL Co.,
Newark, N.J. . . . . U.S.A



Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

trade in Cuba at present, and it is to no one's hurt, as in the cheap and ingenious manufacture of useless articles they have no rivals in the world. In regard to lenses, a line in which German pre-eminence was unquestioned before the war, a search in Havana revealed very few German binoculars, microscopes, or other lenses. French binoculars and field glasses dominated, while the nautical instruments were British, and there were several American microscopes and telescopes.

Messrs. Dixey & Son—Staff Dinner.

The second Staff Dinner of Messrs. C. W. Dixey & Son, was held at the Café Monico on Tuesday, January 24th. In the unavoidable absence of Mr. W. A. Dixey, the chair was taken by Mr. A. G. Freeman, managing partner, and under his genial and efficient guidance the function proved an unqualified success. About forty guests, comprising the staff with their ladies sat down to an eight course dinner which upheld in every way the high tradition of the famous café. After the usual loyal toasts had been honoured, the toast of the Firm was given in his best style of glowing oratory by Mr. C. G. Freeman, and fittingly replied to by the Chairman. The toast of the Ladies was given in graceful manner by Mr. W. Wentworth, and Mr. S. Harrold replied in humorous vein much to the pleasure of his audience. The specches abounded in good natured chaff and were greatly enjoyed. A varied musical programme then followed, the arrangements being in the hands of Mr. A. Kivell. A high standard of excellence was reached, and the efforts of all the artistes met with well merited success. A special word of praise is due to Miss Hermione Griffiths for her tasteful and untiring work as pianist and accompanist. Mr. S. B. Adams, the junior partner, told some witty stories very well indeed, introducing humorous and topical sallies which scored a huge success.

Referring to an accidental omission of his name on p. 28 of this year's Optical Almanac, Mr. D. Beaumont, 2, New Street, Huddersfield, asks us to notify that he is carrying on business as usual under his own management, and under the style of E. Beaumont at the above mentioned address. Mr. A. Burniston, of 9, Park Avenue, Barnoldswick, draws attention to the misspelling of his name, and omission of the asterisk on p. 25 of the Almanac.

THE CARE OF THE EYES.

By the Medical Correspondent of the 'Times Trade Supplement.'

Few faculties are of so great moment to a business man as his eyesight. Indeed, the care of the eyesight is of equal importance with the care of general health.

Nor are the two problems so widely different as might be supposed. Eye troubles figure prominently in the symptom-complexes of many diseases, notably of those which are referable to the kidneys. These organs, it need scarcely be said, play a profound part in the function of getting rid of waste material from the body.

For it is notorious that the business world—usually a sedentary world—is liable to what are called "troubles of elimination." Food is eaten in excess, there is not enough exercise. These two factors, in combination, produce a tendency to chronic poisoning, and may result in the kind of breakdown which is often reflected in eye-trouble.

This, however, gives but a faint idea of the influence of general health on eyesight. That influence is widespread, and extends to young as well as old. In its crudest form it is seen in the optical disturbances which accompany almost every digestive upset—the so-called "bilious attack" or "liver attack" of every-day life. It is also seen in the occasional dimness of vision or unsteadiness of vision of which many business men complain at intervals. At such times the victims are unwell, and most of them would be wise to accept the warning afforded and take measures to recover their fitness. Let it be said again, since it cannot be said too often, that of those measures, exercise is easily the most important.

There is, however, an entirely different group of eye troubles which, while it has no direct connexion with bodily health, can, and does, indirectly, wear down nervous energy. This group includes the so-called "errors of refraction" which are corrected by the wearing of suitable spectacles. There are few things more surprising to the average medical man than the extreme carelessness displayed by the business world in regard to this matter. To-day, in London alone, there must be thousands of men straining their eyes at their desks and lowering their enjoyment of life in consequence. Could they but realise to what a new world a pair of adequate

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

spectacles would introduce them, they would not delay another hour in obtaining it.

But there is an even larger company which wears spectacles bought, almost casually, over the counter of a watchmaker's shop. In some instances, it is true, the watchmaker may possess a sound knowledge of one of the most difficult branches of medical science—refraction. Even so, it is improbable that he will be sufficiently widely instructed to be able to differentiate between defects in the eye as an optical instrument and disease of the eye or disease of the body affecting the eye. Consequently, valuable time may be lost to the resources of treatment.

The Specious Argument.

The reasonable course is never to wear spectacles which have not been specifically prescribed by a medical man with special and recognised qualifications. His fee, whatever it may be, is a cheap price to pay for the safety and security of knowledge that no vital circumstance has been overlooked.

Meanwhile, for those whose eyesight is good, there are certain precautions against trouble which are worth serious consideration. (We set on one side the general rules of health). The first perhaps is to secure that all work is adequately illuminated.

This sounds obvious enough. Yet some experience of City offices has convinced the writer that the advice is necessary. A great many men spend their days in ill-lit rooms and work "half in the dark."

When they turn to artificial light they do not, often enough, improve matters. For the light is frequently placed in such a position in relation to the desk as to ensure the maximum of glare.

One should, if possible, have the light above and slightly behind, in such a position that it does not "entangle" the eye with every upward movement of the worker's head. Diffused light (for example, a "frosted" electric globe) is an advantage. Notepaper should be as devoid of "glaze" as possible. In one case a business man derived great comfort by the simple expedient of substituting unglazed paper for glazed in all his work. Typewriters, however, have come as a great boon in this respect.

The use of smoked glass is another expedient which is valuable and very easy to adopt; and there is something to be said for the provision, throughout an office, of green instead of white blotting paper.

When eyes get tired their lids often tend to twitch or flutter. This is a signal to "cease work." It must be remembered, however, that after an illness such as influenza, the eyes will tire much more quickly than at normal times. They require more care then and should not be overstrained.

Finally the habit of reading in bed is certainly an eye-strainer. As a rule the position is wrong and the eyes are tired out when the reader indulges in the pastime.

Once more, however, it must be said that eye-weariness, in the absence of actual defect, is largely a part of general weariness. It is but one symptom of unfitness, and other symptoms are nearly always present at the same time. Thus the treatment is general rather than particular. Wise men will begin by considering their digestive systems and by asking themselves the vital question: "Am I overloading with fuel a machine which possesses inadequate opportunities of burning it and disposing of the residue?"

Fought out with great cleverness the Bondwell (C. W. Dixey & Son) and St. Andrew's Institute match at Edgware on Saturday, Jan. 28th, was one series of thrills. The "Bees" only fielded nine men at the start, and the home team quickly benefited, being two goals up within fifteen minutes. Bondwell rallied and took command, their forwards controlling the ball in masterly style, and combining with fine understanding. The "Bees" made an excellent recovery, being now at full strength, and the interval arrived with Bondwell deservedly leading by 3—2. On resuming, the "Bees" set up a strong pressure, and the home goalkeeper gave a grand exhibition. For a few minutes the home side had the better of midfield play, but they failed to make any impression on the "Bees" sound and stubborn defence. Bondwell retaliated, but could not score through bad shooting. Just before the finish, St. Andrew's equalised, and despite strong appeals for offside, the referee allowed the point. It is only fair to Bondwell to say, that the game was played 14 minutes over time, and except for these two costly blunders, the referee acted splendidly. Result: St. Andrew's Institute (Cricklewood) F.C., 3; Bondwell F.C., 3. On Saturday, Feb. 4th, the Bondwell F.C. oppose Westminster Wesleyan A.A. F.C. at home, Lea Bridge Road. Supporters meet at Radley's boathouse. Kick-off, 2.45 p.m.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

'Stoco' Optical Machinery

Torcyl. Machines.

Spherical Surfacers with Automatic Polishing Attachments.

"Acme" Rimless Edgers.

"Simplex" Rimless Edgers.

Cutting Machines.

"Kutsall" Diamond Attachments.

"Acme" Drilling Machines.

Hand Tapping, and Broaching Machines.

Spherical Laps, Gauges, etc., etc.

All in stock and thoroughly inspected, ready for immediate delivery.

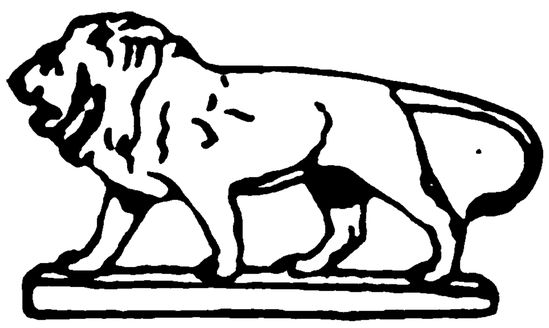
SPECIALLY REDUCED TERMS FOR CASH BUYERS FOR THIS MONTH ONLY.

F. H. C. Lyon,

Wholesale and Manufacturing Optician,

59-61, Hatton Garden, London, E.C.1

Telegraphic Address:
CYLTORREXO, SMITH, LONDON.



Regd. Trade Mark.

Telephone No.:
HOLBORN 1203.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Key to Successful Business is the Trade Paper.

If you advertise, the trade paper gives you a 100 per cent. market; all the readers have a direct business interest in your goods, there is no waste circulation.

If you subscribe, it gives you the latest trade news and technical information. To-day, it is more necessary than ever to be up-to-date in your business; the trade paper will keep you posted. Here are some progressive journals which offer you valuable service as an advertiser, or as a reader.

Aeroplane (London).
Agricultural Gazette (London).
Art Trade Journal (London).
Auto-Cyclist (Sydney).
Automobile Engineer (London).
Auto-Motor Journal (London).
Baker's Confectioners' and Caterers' National Association Review (Lond.)
Bioscope (London).
Box Makers' Journal (Manchester).
Brewers' Gazette (London).
Brick and Pottery Trades' Journal (London).
British and Colonial Mineral Water Trade Journal (Cardiff).
British and Colonial Pharmacist (London).
British Baker (London).
British Builder (London).
British Journal of Photography (London).
Chemical News (London).
China Clay Trade Review (London).
Confectionery Journal (London).
Cooper's Vehicle Journal (London).
Corn Trade News (Liverpool).
Dairy & Creamery Journal (London).
Dairyman (London).
Decorator (London).
Drapers' Organiser (London).
Electric Vehicle (London).
Electrical Industries and Investments (London).
Electricity (London).
Electrics (London).
Engineering Production (London).
Engineering Review (London).
Engineering World (Manchester).
Fancy Goods Record (London).
Fertiliser and Feeding Stuffs Journal (London).
Flight and The Aircraft Engineer (London).
Footwear Organiser (London).
Freemason and Masonic Illustrated (London).
Furnishing Trades' Organiser (London).
Furniture Record and the Furnisher (London).
Games and Toys (London).
Gas and Oil Power (London).
Hardwareman and Ironmonger's Chronicle (London).
Ice and Cold Storage (London).
India Rubber Journal (London).
Indian Industries and Power (Bombay and Calcutta).
Indian Medical Gazette (Calcutta).
Indian Motor News (Bombay and Calcutta).
Indian and Eastern Engineer (Calcutta).
Journal of Decorative Art (Manchester).
Licensing World (London).
"Locomotive" & Railway Carriage and Wagon Review (London).
Managing Engineer (London).
Marine Engineer & Naval Architect (London).
Mechanical World (Manchester and London).
Milling (Liverpool).
Model Engineer and Electrician (London).
Motor Cycle and Cycle Trader (London).
Motor Export Trader (London).
Motor in Australia (Sydney).
Motor Magazine of Canada (Toronto)
Motor Trade of Canada (Toronto).
Motor Trader & Review (London).
Motoring in South Africa (Cape Town).
Motorist & Wheelman (Perth, W.A.).
Music Trades Review (London).
N.Z. Motor Journal (Auckland, N.Z.).
Optician and Scientific Instrument Maker (London).
Organizer (London).
Outfitter (London).
Paper Box and Bag Maker (London.)
Paper Container (London).
Paper Maker & British Paper Trade Journal (London).
Photographic Dealer (London).
Power Laundry (London).
South African Motorist (Johannesburg).
South Australian Motor (Adelaide, S. Australia).
Sports Trades Journal (London).
Stationery World and Fancy Goods Review (London).
Steering Wheel (Brisbane).
Stone Trades' Journal (London).
Sugar Journal, International (London).
Talking Machine News (London).
Textile Manufacturer (Manchester).
Textile Mercury (Manchester).
Textile Recorder (Manchester).
Toyshop and Fancy Goods Journal (London).
Waste Trade World (London).
W.A. Motorist (Perth, W.A.).
Wireless World (London).
World's Carriers' & Carrying Trades' Review (London).

The address of any Paper in this list may be obtained from the Secretary of the

British Association of Trade & Technical Journals, Ltd.,

Sicilian House, Southampton Row.

London, W.C. 1

Telephone No.: Holborn 395

Digitized by Google

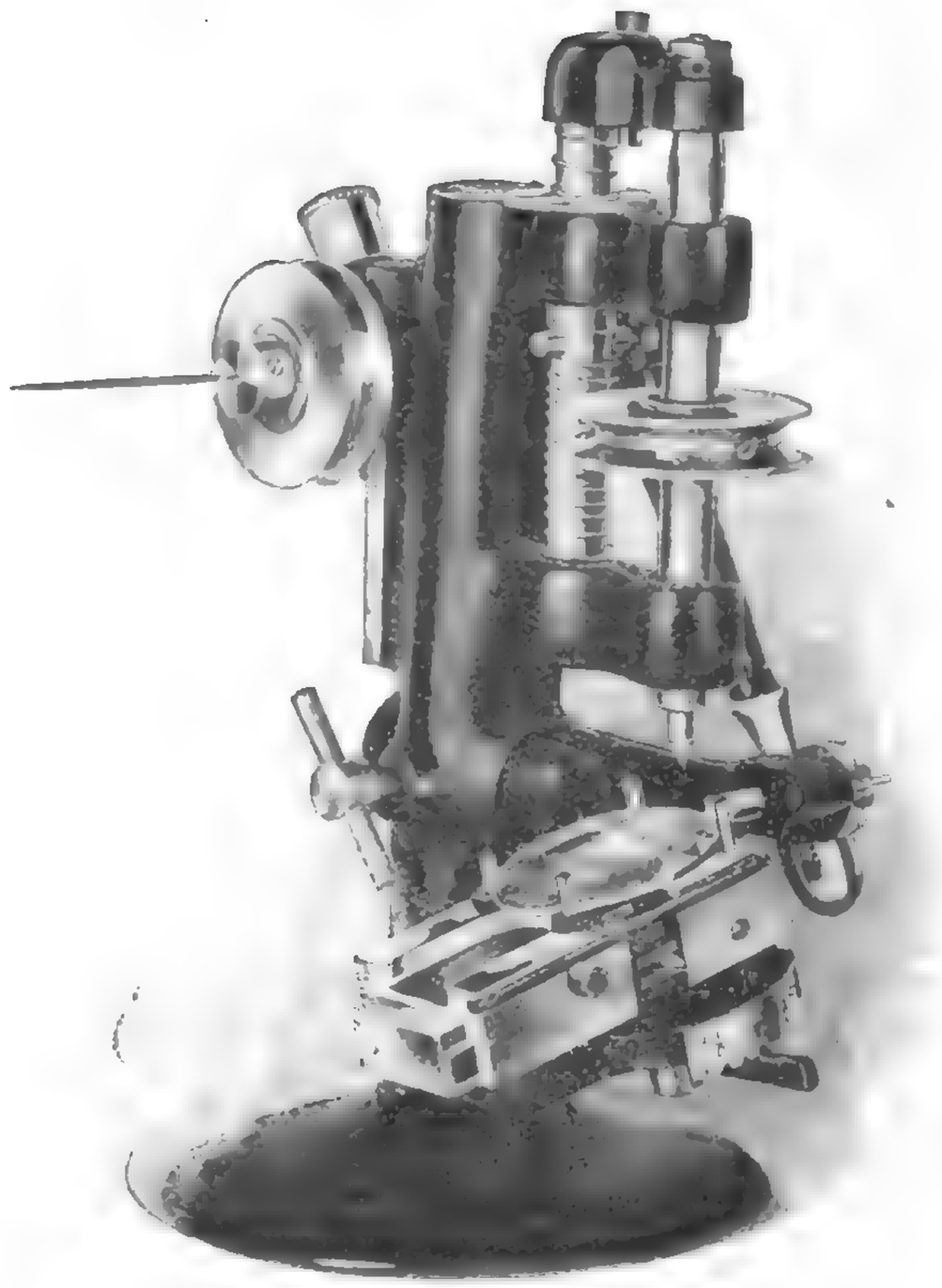
Original from THE OHIO STATE UNIVERSITY

The Universal Lens Drill

The Stoco No. 53-A

This well proven drilling machine, constructed with characteristic Stoco regard for durability, practicability and economy of operation, will drill deep curves as easily as flat lenses.

Its plane adjustments, positive chuck, and tilting table which can be locked rigidly in position assure unfailing accuracy in the location, the angle and the bore of the holes. The patented depth gauge allows the drill to cut only a trifle more than half way through the lens and the holes can be drilled above, below or on center and as near the edge as desired.



Manufactured by

THE STANDARD OPTICAL Co.,

GENEVA, N.Y., U.S.A.

Makers of High Grade Frames, Mountings, Lenses and Optical Machinery.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

F. BARKER & SON, LTD.

SUNDIAL HOUSE,
12, Clerkenwell Road, LONDON, E.C. 1

Registe LONDON Trade Mark Estab. 1848

MANUFACTURERS OF ALL CLASSES OF

SCIENTIFIC AND OPTICAL GOODS.

MANUFACTURERS OF

Aneroid Barometers, Compasses, Drawing, Mining, Surveying & Scientific Instruments of Every Description.

Illustrated and Descriptive Catalogue Post Free to any part of the World. Illustrated Booklet upon Sundials, Barometers and Compasses, Post Free. LISTS FREE.

Correspondence Invited. Bankers' and Trade References.

CLINICAL THERMOMETERS A SPECIALITY

RADIUM COMPOUND

SELF-LUMINOUS.

Highest Possible Efficiency, Durability and Value.

As supplied to H.M. Government, &c.
Guaranteed to pass N.P.L. requirements.
All Grades in stock, from 15/- per gram.
RADIUM SALTS TESTED AND CERTIFIED.

F. HARRISON GLEW

THE RADIUM LABORATORY,

156, Clapham Road, London, S.W.9

MANY SUCCESSES IN THE EXAMINATIONS!

Your Opportunity to

QUALIFY IN OPTICS

PRACTICAL WORK. Students taking the Course may receive personal tuition in the practical work AT ANY TIME DURING THE COURSE.

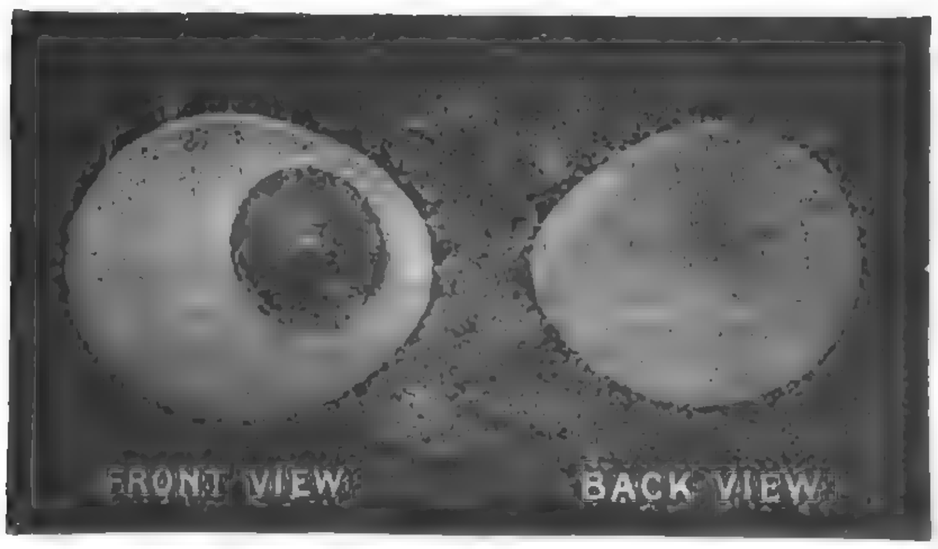
Expert Tuition by Correspondence for the SIGHT-TESTING DIPLOMAS of the Worshipful Company of Spectacle Makers (F.S.M.C.), or the British Optical Association (D.B.O.A.).

Write for full particulars—

C. A. SCURR, M.P.S., F.S.M.C., F.I.O., etc.
64, High Street - - - - BARNET.

SNELLEN'S IMPROVED ARTIFICIAL EYES

PACHE & SON, 75, Station St., Birmingham.



MAKERS TO THE PRINCIPAL HOSPITALS.
Selections sent to Surgeons. Also Makers of the ordinary Shell Eye.



OPTICAL BLOCKS

To illustrate all features of Optical Service. Write for Lists.

Chemists' Design Service,
12, Humberstone Gate, Leicester,

PERCY S. DE SAULLES.

Manufacturer of . . .

MICROSCOPICAL GLASS SLIDES.

Micro Cover Glasses, Glass Cells and Cavity Slips, etc.

The Platts, Amblecote, Stourbridge.

The Optical Society.

President: Mr. R. S. WHIPPLE, M.I.E.E.
Vice-Presidents: Prof. FREDERIC J. CHESHIRE, C.B.E., Director of the Technical Optics Department of the Imperial College of Science and Technology, South Kensington; Sir HERBERT JACKSON, K.B.E., F.R.S.
Hon. Treasurer: Mr. I. G. AITCHISON, B.A., LL.D.
Hon. Secs.: Mr. L. C. MARTIN, B. Sc., Imperial College of Science and Technology, South Kensington S.W.7 and
Papers' Secretary: Mr. F. F. BRYSON, M.A., B.Sc.

SPECTACLES & EYEGLASSES.

Their Forms, Mounting and Proper Adjustment
by R. J. PHILLIPS, M.D.

Fourth edition revised with 56 illustrations.

Price 6s. 6d. Post Free 7s.

THE HATTON PRESS, Ltd., 125, Fleet Street, London, E.C.4

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,

DANDURAND BLDG., MONTREAL.

Cable "Optical" A.B.C. Code 5th. Edition.

Telephone **JAMES B. SLY,** Central 10280.
9 & 10, EDWARD ST., WARDOUR ST. LONDON, W. 1

To S.M.C., B.O.A. & I.O.O. DIPLOMA HOLDERS

Oak frames and modelled gold Arms for the diplomas The Arms of the S.M.C., City of London, and devices of the I.O.O., B.O.A. and Ph. Society in water colours, and framed dark oak, with descriptive engraved plate affixed, 27/6 each. Packed and put on rail.



Printed & Embossed Optical Stationery.
Steel Dies for use of Diploma Holders.
Electros of Coat of Arms & Optical Devices.
Engraved Seals, Prescription Forms, Signs, etc.
Price List on application.

Electro No. 12 Price 3/6

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Style's the thing!



TO-DAY the live, up-to-the-minute sight-testing optician is selling glasses on the basis of style. He's telling his patrons that they *can* wear their Shur-on glasses for tennis or horseback riding; they *can* wear their Shelltex rimmed spectacles with an evening gown, but it isn't the proper thing. The proper thing is to have the glasses fit the occasion.

The proper thing is to have proper Shur-on glasses for reading, for evening wear, for street wear and for sports.

In the Shur-on line, which comprises more than 996 different styles and types of eyeglasses, spectacles and cases ("Quality Beyond Question" since 1864), the optician has the widest possible range of dependable optical goods to select from. Be critical, say "SHUR-ON" to your wholesaler.

Shur-on Optical Co.,

Rochester, N.Y. U.S.A.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d. per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

NEW Sutcliffe Keratometer in perfect order, £25. New Sutcliffe Trial Frame £2, and adjustable trial frame, 30/-. Box 3524, c/o "The Optician," 125, Fleet Street, E.C.4.

FOR SALE. Half-plate stand camera, mahogany, 10" ext. Beck-Steinheil Unofocal Ser. 1., No. 5. f/6 with Beck Celverex shutter, T.B. to 1/80 sec., 3 mahogany double dark slides, stand, focusing cloth, waterproof case, the whole £3 10s. Also ¼-plate Holborn reflex, magazine 12, Ilex, R.R. f/77. T. and I to 1/100 sec. Leather case, £2. Please address, Box 3508, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

SMALL Business for sale, sight-testing only, opened 20 months. Turnover last six months £182, nicely fitted. Total expenses 18/- weekly, price £200, stock at valuation. Apply, Box 3523, c/o "The Optician," 125, Fleet Street, E.C.4.

WELL-EQUIPPED Sight-testing and photographic dealer's business for sale in good town about 20 miles from London. With or without nice dwelling house over. Good opening for qualified optician wanting a start. Bona fide reasons for selling. Particulars from Box 3526, c/o "The Optician," 125, Fleet Street, E.C.4.

OPTICIAN'S Business, large Lancs. town, for immediate disposal. Suit young energetic man with small capital. Box 3525, c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 8*

CAPABLE Man wanted for sight-testing, must be good salesman, and reliable watch jobber, permanency to good all-round man. State age, wage required, experience and particulars to Box 5848, c/o "The Optician," 125, Fleet Street, 125, Fleet Street, E.C.4.

COMPETENT Refractionist (O. & S.) and keen salesman, 9 years' experience, requires post in London as manager or first assistant. Box 5858, c/o "The Optician," 125, Fleet Street, E.C.4.

OPTICAL Engineering. Associate Royal College of Science seeks engagement with a manufacturing firm. Age 27. Physicist and mathematician. Box 5846, c/o "The Optician," 125, Fleet Street, E.C.4.

NORTHAMPTONSHIRE COUNTY COUNCIL EDUCATION COMMITTEE.

Applications are invited from qualified Opticians who are desirous of tendering for the supply of Spectacles for children in the Elementary Schools in the Administrative County, during the year 1st April, 1922, to 31st March, 1923.

Particulars and forms of tender, which must be lodged with the undersigned not later than Friday, 10th February, 1922, can be obtained from

J. L. HOLLAND,
Secretary for Education.

County Education Offices,
Northampton.

Digitized by Google

WE ARE

All obliged to consider carefully what we pay for our goods now-a-days, and even a small saving, if often repeated is worth while, provided quality is there.

Quality is our first consideration, and no matter how high the price paid, it is not possible to obtain better quality than W.O.W

You want proof? Then send a trial Rx order to W.O.W.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY:
DUDDEN HILL LANE, N.W.10

Consol Junior Bench complete with all accessories. Absolutely new. Stored London Warehouse, where it can be inspected. No reasonable offer refused. Box 3522 c/o The Optician, 125, Fleet Street, London, E.C.4

BAKER 244 HIGH HOLBORN LONDON

Estab. 1765

REPAIRS

to all kinds of Scientific Apparatus carried out in our own Factory.

Work Returned Promptly. Charges Low

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
C. G. DYMOND. M.I.Mech.E., F.I.C.P.A

W. P. THOMPSON & Co.,
12, CHURCH STREET, LIVERPOOL.
Chartered Patent Agents.

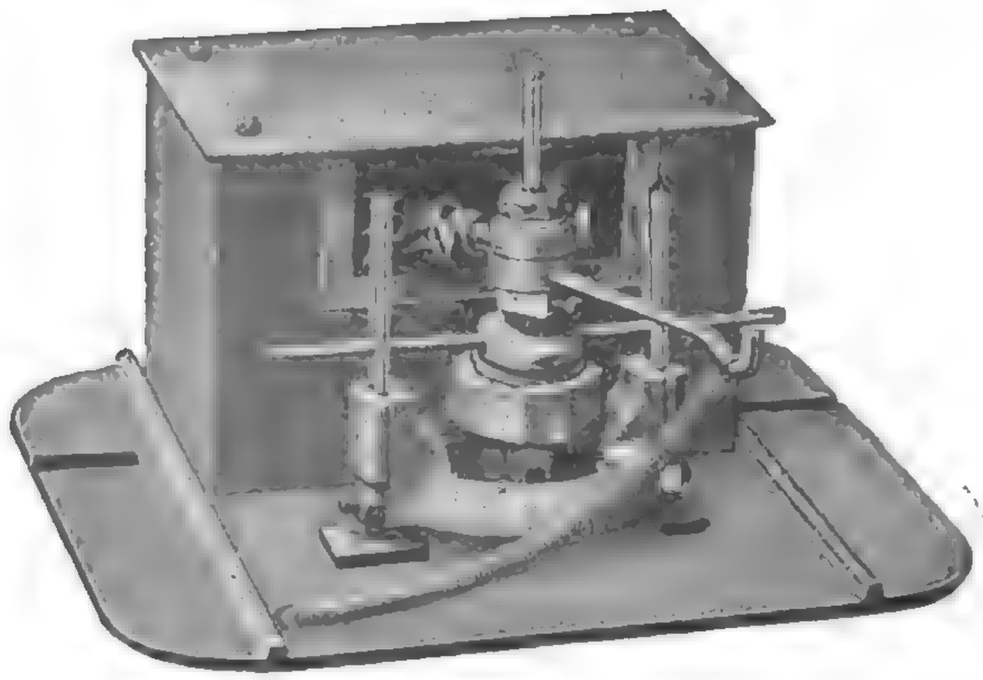
H. E. POTTS. M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and ABRONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
ESTABLISHED 1878 TELEPHONE CITY 419

Original from THE OHIO STATE UNIVERSITY

"SOMCO" Auto-Surfacing Machine.

British Industries FAIR, WHITE CITY, February 27th— March 10th. OUR STAND **E18**



The "SOMCO" Demonstrated in operation at OUR STAND **E18**

PLEASE NOTE CHANGE OF ADDRESS—

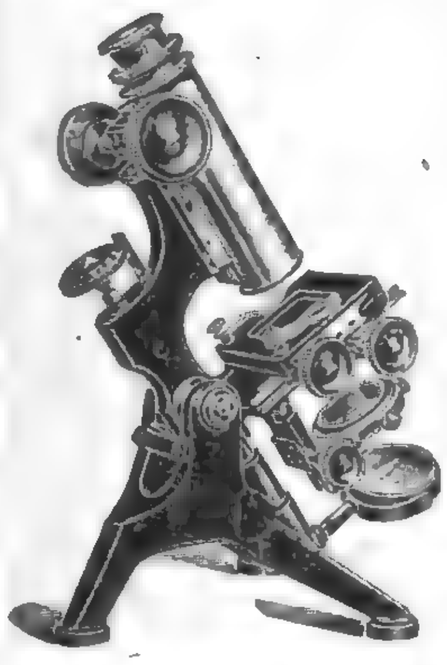
SURGICAL & OPTICAL MFG., Co.,

~~22, Union Road, Clapham, S.W.4~~

35, CHARLES STREET, HATTON GARDEN, E.C.1

SELL WATSONS' BRITISH-MADE MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,
313, High Holborn, W.C. 1

Works: High Barnet, Herts. Established 1857.

Scientific Instrument Makers.

MICROSCOPES of all kinds manufactured at our own works.
REPAIRS to Prismatic and other Binoculars etc., promptly executed.

H. H. SHARLAND (H. KEMP), 9 & 10, THAVIES INN, HOLBORN CIRCUS, LONDON, E.C. Established 1864. Tel.: Holborn 4840.

Every Description of Ophthalmic Supplies. All Requirements of the up-to-date Sight-Testing Optician. Good Special Lines at keenly Competitive Prices.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

***A*.—Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. jor each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

WANTED, qualified optician to manage sight-testing and general optical business in the South of England. Apply, Box 5856, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION wanted by capable organiser with wide experience in all departments of wholesale ophthalmic trade. Has also considerable retail experience in handling general optical, photographic and nautical goods. Expert refractionist, fitter and salesman. Highest references. Box 5855, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED Youth to learn business of ophthalmic optician (town near London). Full particulars to Box 5854 c/o "The Optician," 125, Fleet Street, E.C.4.

TORTOISESHELL Worker wants work, good filer, joint and finisher. Box 5853 c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION as sight-testing optician. Highest efficiency in use of ophthalmoscope and retinoscope. Could take charge of workshop or work in same. Sitting for examination in June. References, first-class. London or South of England preferred, or abroad. Box 5852, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN (21), 5 years' experience with dispensing optician. Good salesman, seeks engagement. Reply, Postlethwaite, Earle Road, Edge Hill, Liverpool.

CAPABLE Rimless driller and fitter, 7 years' experience, good knowledge of workshop, excellent references. London preferred. Box 5851, c/o "The Optician," 125, Fleet Street, E.C.4.

TEMPORARY Engagements, sickness or holidays, F.S.M.C., D.B.O.A., Locum, 59, Eden Street, Kingston-on-Thames.

D.B.O.A. Young Lady, experienced, desires position with good class firm of sight-testing opticians. Box 5850, c/o "The Optician," 125, Fleet Street, E.C.4.

CAPABLE Manager or first assistant requires position, **good refractionist, 14 years' experience, able to take full** charge of workshop, excellent credentials. Apply, Box 5849, c/o "The Optician," 125, Fleet Street, E.C.4.

COUNTRY Representative wanted by important wholesale London house. Good salary, commission and full expenses paid. Apply, Box 5857, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT Wanted, shorthand-typing advantage. Letters, full particulars, experience, age, salary, etc. Ross-Jenkins, Wholesale Opticians, 31, High Holborn, W.C.1.

QUALIFIED Assistant seeks re-engagement, served practical apprenticeship A to Z in workshops, last 2 years' sight-testing, good salesman, torics and kryptoks. F.S.M.C., c/o Ebbage & Son, Consulting Opticians, Kingston-on-Thames.

REPRESENTATIVE wanted by well-known house of wholesale and manufacturing opticians. Apply, Box 5847, c/o "The Optician," 125, Fleet Street, E.C.4.

MANAGER'S Situation wanted, preferably in Yorkshire or Lancashire, by experienced ophthalmic optician who would require about 6 weeks to dispose of his present ophthalmic business. Married. Aged 27. Excellent salesman. Box 5835, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN, 21, studying for F.S.M.C., desires progressive position. Box 5834, c/o "The Optician," 125, Fleet Street, E.C.4.

CAPABLE Surface Worker desires change, South of England preferred, experienced in kryptoks, torics, etc. Disengaged when suited. Box 5836, c/o "The Optician," 125, Fleet Street, E.C.4.

MECHANIC used to meterological and general instrument work, hand-turning bench, finishing and lacquering. 18 years' experience, any distance, town or country. F. Orford, 83, Ashmore Road, Paddington, W.9.

JEWELLER-OPTICIAN'S Son, 21, passed major part S.M.C., desires post with optician, London, where good practical experience can be obtained. Vennall, High Street, Chesham, Bucks.

LADY, 25, seeks re-engagement in optical trade. Trained under Ministry of Munitions, had two years' experience as surfacer and polisher, now learning bevel and rimless edging. Write, E. W. Shepherd, 111, Broadwater Road, Tottenham.

REFRACTIONIST, aged 20, 4 years' experience, prescribed over 10,000 cases, seeks employment. V.K., 1, Dewhurst Road, West Kensington Park, W.14.

FIRST-CLASS Lens surfacer requires situation, London only. Charge preferred. 40 years' experience. A.S., 80, Prebend Street, Islington.

GOOD All-round jobber and bevel and rimless glazing and fitting requires situation, retail optician with own plant preferred. Box 5843, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., aged 24, desires change as assistant or branch manager. London or Brighton districts preferred. Moderate salary. Apply, Box 5842, c/o "The Optician," 125, Fleet Street, E.C.4.

CAPABLE and well educated assistant requires position. Passed preliminary F.S.M.C. Thorough knowledge of sight-testing. Box 5841, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT qualified for sight-testing, London. Send full particulars, photo, salary required to Box 5832, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS Lens Surfacer requires situation, 9 years' experience with London firms. Apply, J.S., 80, Prebend Street, Islington, N.1.

APPRENTICESHIP required for a well educated youth, with well established provincial optician, to live in. 118, Wellington Road, South Hounslow.

GOOD All-round gold frame maker and jobber, first-class references, could take charge. Box 5840, c/o "The Optician," 125, Fleet Street, E.C.4.

LADY Assistant require post, 6 years' experience sight-testing, retinoscopy, repairs, etc. Can take charge. Highest references. Box 5839, c/o "The Optician," 125, Fleet Street, E.C.4.

ABLE Experienced successful refractionist with ready capital desires position in good class business where proprietor would like to retire gradually. Excellent credentials. Qualified. 9, Upper Belmont Road, Bristol.

SURFACING Charge Hand seeks situation, used to first class work only, 20 years' experience, distance no object. Box 5838, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., 27, desires berth as assistant or manager, keen salesman. London preferred. Box 5845, c/o "The Optician," 125, Fleet Street, E.C.4.

REFRACTIONIST, over 20 years' sight-testing experience, retinoscopy, etc. Good salesman, seeks engagement. Reply, Optician, 78, Durham Road, Sparkhill, Birmingham.

OPTICIAN'S Son, between 20 and 21, passed B.O.A. examination, certificate in November. Capable refractionist, thoroughly practical, gentlemanly address, desires position, North preferred. Box 5827, c/o "The Optician," 125, Fleet Street, E.C.4.

Concluded on page 6.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

If you Employ Surfacing Tools,

It will be of interest to you to know that

we now undertake for our Customers

the CORRECTION of

Spherical, Cylindrical and

Toric Tools.

Our charges are reasonable and the work is done promptly and accurately.

When next your tools require correction, kindly send them through your wholesaler to

UNITED KINGDOM OPTICAL CO., LTD.,

(Wholesale and Export Only.)

MILL HILL, LONDON, N.W.7

Digitized by Google

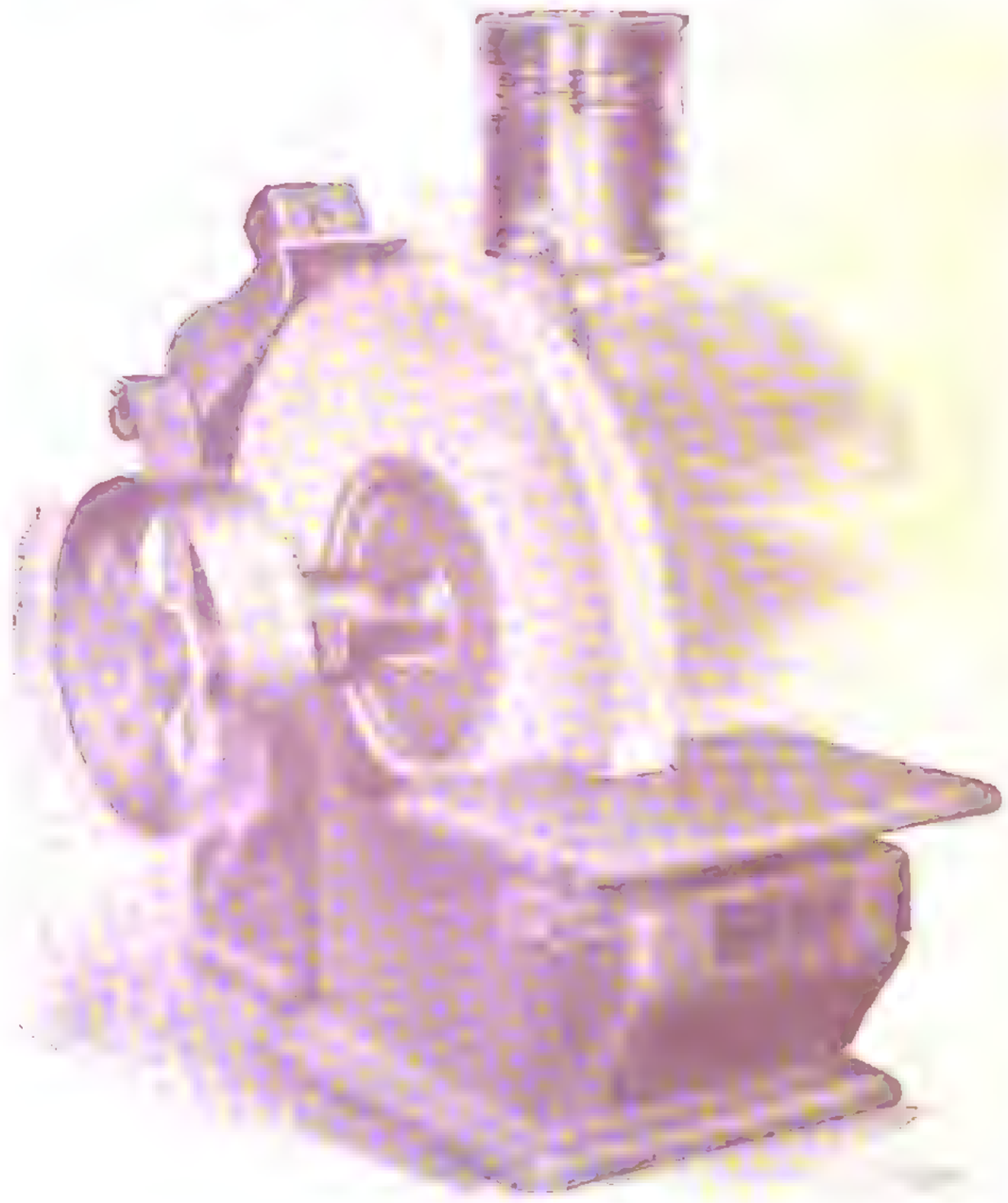
Original from THE OHIO STATE UNIVERSITY

AMERICAN OPTICAL COMPANY, LIMITED.

WELLSWORTH HAND EDGERS.



M.80



M.82

M.80 Hand Edger on legs. Stone 20 inch diameter fast and smooth cutting without undue speed.

M.82 Hand Edger for bench. Stone 16 inch diameter with Honing Device constantly acting on face of stone maintaining a smooth even cutting surface—a perfect Machine.

For further information apply to your Wholesaler.

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C., 4. Printed by The Century Press, Finsbury, London, E.C.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT · MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1611 FRIDAY, FEB. 10, 1922.

"FITS-U" IS THE FINGERPIECE YOUR CLIENTS WANT—

GIVE IT TO THEM.



Perfection obtained in Bilt-In Bearing construction.

It will stay on in a pinch without pinching and they know it!

We have rejected hundreds of devices in developing "Fits-U," the perfect Fingerpiece that will ***stay on*** with practically no pinching or gripping—and if you try to sell a Fingerpiece that won't give service you are failing to take advantage of years of experimenting and effort.

Get "Fits-U" and increase your profits and prestige.

Covered by British Letters Patent.

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

AMERICAN OPTICAL COMPANY, LIMITED,

39, Hatton Garden, LONDON, E.C.1

Reg'd at the G.P.O. as a newspaper **PRICE 4d** *Subscription post free 12 months 17s*

Postage in United Kingdom **1d**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Foreign Subscription including "Optical Almanac" post free 20s. yearly. The Hatton Press, Ltd., 123-5, Fleet St., London E.C.4

GEORGE CULVER LTD.

Manufacturing Opticians

The "RAPID"

Curved Lens Demonstrator

Patent No. 112074



A MOST CONVINCING DEMONSTRATION OF THE ADVANTAGES GAINED BY USING TORIC OR MENISCUS LENSES IN THE PLACE OF BICONVEX OR BICONCAVE.

Particulars and Price on Application.

WHITE LION STREET
PENTONVILLE
LONDON. N.1.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

W.H.T.

QUALIFIED BY EXPERIENCE

You do not "take RISKS" when you place your Rx work with us, we have an efficient and experienced staff, up-to-date equipment and every possible facility for executing :-

RX SERVICE.

OPTICAL SUPPLIES OF EVERY DESCRIPTION.

Samples and Prices on application.

WALTER H. THOMPSON

66 HATTON GARDEN, LONDON, E.C. 1.

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

TORICS.

Toric prescriptions can only be satisfactorily produced by a firm accustomed to high grade work.

We have made a feature of this work since torics were first introduced, now many years ago, during which time we have constantly been acquiring valuable experience and establishing the finest possible equipment.

Send your next toric job to any of the addresses below.

J. & R. FLEMING LTD.,

Telephone:
HOLBORN {814 / 815
HOLBORN {2788 / 2789} Prescription Dept.

136-148 Clerkenwell Road,
LONDON, E.C. 1.

Telegrams:
"OTTICO." LONDON.

Branches with Prescription equipment:

J. & R. FLEMING (Brgm.), Ltd.
6, Key Hill Drive,
BIRMINGHAM.
Phone: Central 2509
Telegrams: "Brahma."

13a, CUSTOM HOUSE ST.,
CARDIFF.
Phone: Cardiff 745
Telegrams: "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1085.
Telegrams: "Ottico."

8, SHUDEHILL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master:
The Rt. Hon. VISCOUNT HILL, L.C.C.

Upper Warden:
CHARLES E. SEBAG-MONTEFIORE, Esq.

Renter Warden:
HARRY HYLTON-FOSTER, Esq., Past Master.

Director of Examinations:
The Rt. Hon. Sir WILLIAM HART-DYKE, Bt., M.A., Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C.4.

Official Instructor:
Mr. LIONEL LAURANCE.

Director of THE SCHOOL OF OPTICS, Ltd., 2, GUILFORD PLACE, W.C.1.

The NEXT EXAMINATIONS

of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in May, 1922.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT·MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,611

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

Organ of the Optical, Photographic, Meteorological, Nautical, Philosophical, Mathematical and Electrical Instrument Industries.

Official Organ of the SOCIETY OF CHEMIST-OPTICIANS—the WEST RIDING OPTICAL SOCIETY—the MANCHESTER AND NORTH OF ENGLAND OPTICAL SOCIETY—the SCOTTISH OPTICAL ASSOCIATION the NORTHERN COUNTIES OPTICAL SOCIETY—the MIDLAND OPTICAL SOCIETY—the NATIONAL ASSOCIATION OF OPTICIANS—the LIVERPOOL AND DISTRICT OPTICAL SOCIETY—the INSTITUTE OF OPHTHALMIC OPTICIANS OF NEW SOUTH WALES—and the NEW ZEALAND OPTICAL ASSOCIATION.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, FEB. 10, 1922.

Value For Money in Education.—A very sensible letter was in last Saturday's 'Daily Mail,' signed "Medical Officer," dealing with the question of public expenditure on education, which is rather prominent just now. The letter is as follows:—" 'Manufacturer' asks the question 'Is the nation getting value for the money it spends on education.' The answer is 'No!' In my professional capacity I am brought into contact with a large number of children annually. I find that at least 50 per cent. or more who have passed the Sixth Standard are unable to do a simple subtraction sum, such as taking age (say 14) from 1922 so as to obtain their year of birth. In addition, what do infant departments of schools cost us in sickness (whooping cough, measles, and other school diseases)? I venture the estimate of about 25 per cent. of the cost of our (so-called) education proper. The remedies are:—(1) Day nurseries and playgrounds for infants up to 7 or 8 years of age. (2) The three R's onwards for 5 or 6 years. (3) Higher education for 'adaptable' children. But I doubt if the 'cranks' would listen."

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Cranks of course will not hear of the proposition that elementary education, paid for by the taxpayers, should be just what its name implies, a groundwork for that "higher education" which is so accessible to everyone, rich or poor, in the school of life. Instruction in reading and writing are claimed as the birthright of children in a civilised community, providing as they do the gateway to all useful knowledge, with admission to the storehouse of literary art, from which intelligent youth is better able to acquire the satisfaction of his intellectual needs than is an average board school teacher to impart it. The public libraries, maintained at public expense, are universities which should be far more frequented, and would be if they were better advertised; and in one direction—by weeding out trash and investing more on works of technical value and of literary importance—better organised than now. The difficulty that stands in the way is the educationist interest of the school teachers who are such a numerous fraternity, and press for the extension of State education so that their employment may be raised in status and more highly paid. It is to be hoped that the fall of the Geddes' axe in the direction indicated will not be stayed unduly by vote-catching politicians. Boys who have not been able to acquire fully the arts of reading and writing at fourteen years of age are not educable in the true sense of the term, and in an economic system must be left out of cultivation like stony ground. On the other hand, to those showing special aptitude in board school, probably few taxpayers will grudge the special opportunities of higher education that scholarships provide.

* * *

Optical Education.—Letters have been published in our columns from employers within the past few years, complaining of the deplorable ignorance of arithmetic among boys passed out of school at fourteen years of age into employment. If there is any intention or desire to promote a youth to something better than purely manual occupation, some proficiency in the third "R" is essential. As commonly taught, arithmetic is an unattractive, not to say arid and repellant study, and even a boy who has a natural bent towards mathematical work may be discouraged by drilling him in formal processes devoid of appeal to the reasoning faculty. Intelligent method and imagination in teaching arithmetic would save untold waste of time and money. There are good disciples of Augustus de Morgan among us to-day; but their influence seems to be negligible in the board schools. Particularly among the youths who aspire to qualify as assistants to sight-testing opticians, a sound knowledge of arithmetic is essential. Optics is one of the mathemātical sciences; but the first elements of optics, that is all that is strictly necessary as distinct from what is desirable for a sight-testing optician, can be reduced to simple arithmetic—vulgar and decimal fractions. Such works as "The Optician's Handbook" by an Ophthalmic Surgeon, issued by our publishers, demonstrate how easy it is, with a little diligent attention, to pass from the stage of rules-of-thumb, common among ignorant spectacle-fitters, to "qualification" which is a valuable safeguard for the public, even if not so advanced as is required when preparing for a diploma examination conducted on more mathematical lines.

Recent Optical Patents.

Complete Specifications Published.

1920.

143907. Irinyi, Bunsen burners.
146137. Optische Anstalt C.P. Goerz Akt.-Ges., Toric spectacle lenses.
146413. Optische Anstalt C.P. Goerz Akt.-Ges., Periscopes.
147938. Signal Ges., Subaqueous sound producer and receiver.
148416. Signal Ges., Sound transmitting arrangement.
149334. Scherler, Recording devices for instruments and the like.
155223. American Optical Co., Lenses.
169238. Hammon, Spectacle lenses.
169249. Taylor, Means of focusing optical instruments.
169253. Barr & Stroud & Strang, Range-finders for submarine and other periscopes.
169304. Frink, Glass melting furnace.
169397. Farquae, Sights of fire arms
169495. Bailey & Pattison, Mathematical demonstration apparatus.
169500. Carter, Kinematograph cameras.
169533. Shepherd & Colour Photography, Ltd., Colour photography.
169537. Frink, Glass annealing furnaces and the like.
169595. Jackson, Crucible glass melting furnace.

Matter intended for the current weeks' "Optician" must reach this office on the Tuesday morning preceding publication.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Pitfalls and Danger Signals in the Path of the Prescribing Optician.

Report of a Lecture by Dr. MAITLAND RAMSAY, delivered before the Scottish Society of Ophthalmic Opticians.

In an introductory lecture delivered to his class in 1839, an eminent ophthalmic surgeon, the late Mr. Richard Middlemore, said "It has many times fallen to my lot to be consulted by persons suffering from chronic inflammation of the retina, which has proceeded so far as almost to destroy vision. They tell me that the eyes were not much reddened or painful in the first instance; they watered and were somewhat intolerant of light; that after a time the sight became dim, and the intolerance of light diminished; that they then had recourse to spectacles, which scarcely at all improved vision, and that now they possess hardly any useful degree of sight. In other instances they inform me that the medical gentlemen they consulted examined the eyes very slightly, and told them that their sight was getting weaker, and that they required spectacles, which they accordingly procured, and with which they certainly did see better for a short time, which encouraged them to continue their use and increase their power, until all but total blindness ensued. What must be the feelings of that surgeon, who, in connection with an unfortunate case of this description felt constrained by truth to say 'this person who is now condemned for life to blindness consulted me when his complaint first appeared, and owing to my ignorance and inattention he is now deprived for ever of the blessing of sight.' "

That is my text. It is, however, very far from my intention to criticise or to blame. We all make mistakes, and the best we can hope for is that we do not make the same mistake twice. The majority of opticians of the present day have been trained in physiological optics, and possess a more or less intimate knowledge of the anatomy of the eyeball—that little darkened chamber which is the light of the whole body. Nevertheless as Helmholtz has said, "the eye has every possible defect that can be found in an optical instrument, and even some which are peculiar to itself, but they are all so counteracted that the inexactness of the image which results from their presence very little exceeds, under ordinary conditions of illumination, the limits which are set to the delicacy of sensation by the dimensions of the retinal cones. But as soon as we make our observations under somewhat changed conditions we become aware of the chromatic aberration, the astigmatism, the blind spots, the venous shadows, the imperfect transparency of the media, and all the other defects of which I have spoken. Now it is not too much to say that if an optician wanted to sell me an instrument which had all these defects, I should think myself quite justified in blaming his carelessness in the strongest terms, and giving him back his instrument. Of course I shall not do this with my eyes, and shall be only too glad to keep them as long as I can—defects and all. Still, the fact that however bad they may be, I can get no others, does not at all diminish their defects, so long as I maintain the narrow but indisputable position of a critic on purely optical grounds. The eye in itself is not by any means so complete an optical instrument as it at first appears; its extraordinary value depends upon the way in which we use it; its perfection is practical, not absolute, consisting not in the avoidance of every error, but in the fact that all its defects do not prevent its rendering us the most important and varied services."

In no circumstances, therefore, can the living eye be treated simply as an optical instrument, whose defects can be rectified absolutely by means of suitable lenses. It is not only in the body, but it is also of the body, and hence the fallacy of the contention that spectacles concern the optical part of the eye only and have nothing to do with disease. The prescription of glasses, although essential and all important, cannot in many cases be regarded as the whole treatment. It is not enough, more especially when one is dealing with the young, simply to adjust lenses suitable for the correction of the error of refraction. A quick estimate must at the same time be made of the patient's general strength, for it is most important to remember that although the demand for work upon the ciliary and the extraocular muscles may not be unreasonably great in itself, yet it may be

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

altogether excessive in respect of the individual in whom it is made. That is where the physician is required, because if treatment is to be successful it must be based on an intimate knowledge of pathology, not only of the eye but of the body as a whole.

It would, however, in these days, be a counsel of perfection to say that everyone who thinks he requires glasses should in the first instance consult his doctor or an ophthalmic surgeon. If any attempt were made to maintain such a position thousands of men and women would be found ready to refute it and to bear testimony to the skill and experience of the optician, whose thorough training entitles him to deserve the respect and the confidence of the public. The object of this lecture is simply to point out certain limitations in his work, and to discourage him from assuming knowledge which is outwith the scope of his curriculum. The need for patience, thoroughness and accuracy in refraction work is admitted by everyone, but it is sometimes necessary to remind the refractionist that he is treating patients and not eyes, and dealing with living men and women and not with a mechanical optical apparatus.

The Eye as an Optical Instrument.

Pardon me for recalling a few elementary facts bearing on the eye considered as an optical instrument. The eye may be regarded as a living photographic camera, provided with a dark chamber of a definite length, and with an adjustable lens system, and a diaphragm whose opening varies in size according to the brightness of the light. A proper diaphragm is an indispensable part of every optical instrument, but if the size of the pupil was fixed it would fail to meet the requirements of the change of focus from infinity to the near point. One of the most wonderful features of the eye is that by means of a common nerve supply that difficulty has been overcome, and such an arrangement ensures that both the ciliary muscle and the iris contract simultaneously. Images are thereby accurately focused on the retina, and the visual acuity is greatly increased. If vision be clear on the horizon, when the eye is in a state of rest, parallel rays are brought to a focus on the retina, and the condition is called emmetropia; whereas if parallel rays came to a focus behind the retina, the condition is hypermetropia; and if in front of the retina, myopia. The cause of an error of refraction, therefore, is in the great majority of cases due to the length of the eyeball. The emmetropic eye being regarded as normal, the hypermetropic eye is too short, and the myopic too long. Obviously alteration in the curvature of the cornea, of the refractive index of the media, or of the position of the retina, or the absence of the crystalline lens, will also produce an error of refraction; but these are only the exceptions to the general rule, and no further reference need be made to them at present, except to point out that unequal curvature of the cornea always gives rise to astigmatism.

Power of Accommodation.

The normal, or emmetropic eye, moreover, can not only see distant objects distinctly without effort, it can with equal ease see to read or to sew. To meet the requirements of near vision, the refractive power of the lens is increased. That inherent focusing arrangement is called the power of accommodation, and is brought into play by the action of a small muscle in the interior of the eye called the ciliary muscle. When it contracts the lens become more convex, and consequently its power of refraction becomes increased. By that means, therefore, every eye possesses the power of adding to its static refraction, a definite amount of dynamic refraction, by which it is enabled to see at varying distances —from the horizon to the nearest point of distinct vision. This near point, which may be regarded as the ordinary reading distance —*i.e.*, about ten to twelve inches from the eye—is always in the same position in all emmetropic eyes of the same age. The greatest power of accommodation which can be exercised is spoken of as the amplitude of accommodation, and as it steadily decreases as age advances the near point gradually recedes from the eye. By the time an emmetropic patient is forty-five to fifty years of age, the near point is so far distant that he is quite unable to read, although he can still see distinctly on the horizon. It is this diminution of the range of accommodation as a result of age, and the difficulty in seeing small print at the ordinary reading distance, which are the distinguishing marks of presbyopia, or aged sight.

The clients, who consult an optician, may be divided for convenience into three classes:

1. Those who see well at a distance, but who have difficulty in seeing near at hand.
2. Those who can see quite easily to read or to sew, but cannot see in the distance.
3. Those who have difficulty in seeing both near at hand and in the distance.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



Chance's 'CROOKES' Glass

REMEMBER that the formula for a glass is only a part of it. Few other things than optical glass depend as much for their success upon the skill, experience and resources which are applied to their manufacture.

That is why ***Chance's*** is so essential a part of the title ***Chance's 'Crookes' Glass.*** None is genuine which does not come from these works.

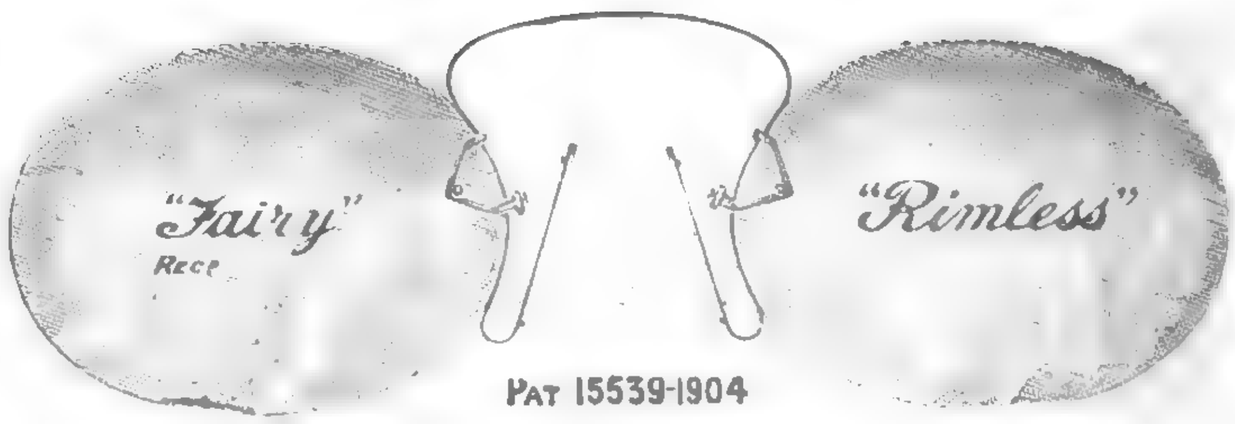
CHANCE BROS. & CO., LTD.,
GLASS WORKS, SMETHWICK, BIRMINGHAM.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Phone:—City 3225 (3 lines) *Telegrams:—Bulford, BARB. London.*

PATENT "FAIRY" REG.D MOUNTINGS.

Have taken a distinctive place in the World of Eyeglasses
SOLELY UPON MERITS.



By the Patent Method of Attachment, they, as it were, make the two Lenses and Fitting One Piece, giving that Rigidity upon the face which makes them a pleasure to wear.

Royalty wear them; people of note wear them, and it should interest you to sell them as we make them in Gold only.



There are Points of Refinement in the design rendered possible only by the Patent Method of Attachment to the Lenses.

Made by the firm whose Reputation for Prescription Work is:—*"Second to None."*

NEWBOLD & BULFORD, ***Prescription House,***
GOSWELL ROAD, LONDON
E.C. 1

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

1. Those, who see in the distance, but have difficulty in seeing near at hand.

It is common knowledge that sight for near objects fails with the advance of years; nevertheless presbyopia often reveals itself somewhat suddenly and patients are considerably alarmed when they first discover that they can no longer read the evening paper or thread a sewing needle. They can see if they hold the object farther from their eyes than they have been accustomed to do, and if they have plenty of light. The longer they try to see, however, the eyes become more and more uncomfortable, and printing or needlework becomes confused and appears to have a misty cloud before it, while the letters in a line of print run into one another and seem to disappear. It is usually, however, not difficult to reassure those patients, because in a simple case of presbyopia, distant vision, tested by Snellen's types, is found to be up to standard, *i.e.*, 6/6; and a weak convex glass at once restores the power to read the smallest print. The spectacles make up for the deficiency caused by the failing power of the ciliary muscle, as well as from the hardening of the lens from age. It is very important that they should not be too strong; for if so, the wearer will have to hold his book very close to see distinctly, and will grumble at this inconvenience; he will also suffer much discomfort from the strain thrown on the internal recti muscles in their efforts to keep up the excessive convergence necessary for such a short focus. It is always wise to determine the ordinary reading or working distance of the individual client and to adjust the spectacles accordingly.

Unit Magnification.

Reading glasses ought not to magnify the print, for if they appear to do so they are too strong; all that is wanted is that the type is clear and sharp in outline, when held from ten to twelve inches from the eyes. In many cases there is a prejudice against the use of glasses, and some consider them a nuisance and an evidence of bad sight. They are, however, a great boon to anyone suffering from presbyopia, clearing outlines which were becoming indistinct, brightening colours which were beginning to fade, and restoring near vision which through the years had been steadily, though imperceptibly, declining.

A presbyope needs stronger glasses as time goes on, and as a rule will require to change them every four to five years, about +1D. being added each time. If, however, the presbyopia increases very rapidly and a client asks for stronger lenses every few months, there is more wrong than can be explained by a simple error of refraction. Rapid increase of presbyopia is one of the premonitory signs of the dread disease glaucoma, and that diagnosis is very likely to be correct if the patient also complains that every now and then he seems to see everything through a fog, and that every light he looks at is encircled by coloured rings—an appearance that must be familiar to everyone who has driven in a cab on a frosty night and watched the street lamps through the steamy windows.

"Second Sight."

On the other hand if it be noticed that instead of taking stronger spectacles as age advances weaker lenses are preferred for reading, or it may be that the person says he can see better near at hand without the aid of lenses, although in former years he required to wear convex glasses for reading. Such a one is generally much pleased at this discovery, and boasts that he has got his "second sight." If, however, his vision be tested it will be found that he is now myopic and requires concave lenses to enable him to see in the distance although formerly he saw quite well out of doors without glasses. Obviously such symptoms are due to changes taking place in the crystalline lens, and in the majority of cases are symptomatic of cataract. Great caution, however, should be exercised in the use of the word cataract because it is apt to convey a false impression,and create much unnecessary alarm. Many a person after learning of such a diagnosis will live in constant dread of the onset of blindness which may never come. In these circumstances the optician will be well advised to refer his client at once to a specialist, and to say as little as possible.

Both in chronic glaucoma and in incipient cataract there may be little difficulty in enabling the patient by the aid of suitable lenses to read 6/6 in Snellen's test types. That leads me to say that the observation that a man has standard vision, if it be considered simply as an isolated fact, is no guarantee that his eyes are healthy. A patient may complain that a black cloud now and again momentarily passes before his sight, although when tested with Snellen's types his vision is found to be normal in the intervals between the attacks. Nevertheless examination with the ophthalmoscope may reveal optic neuritis in both eyes and after a careful scrutiny an experienced physician will be able

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

to interpret the inflammation of the optic nerves as a cardinal sign of tumour of the brain. It is the association of signs and symptoms that matters, and it is only a medical man who is able to assess these phenomena at their proper value. It may be said, therefore, that it is the ability to determine the relative importance of all the symptoms present in an individual case that distinguishes the skilled ophthalmologist from the mere refractionist.

General Health and Accommodation.

When the need for glasses for reading or sewing occurs prematurely the cause in the great majority of cases is hypermetropia, but premature failure of accommodation, and especially steady increase of presbyopia at an early age, ought at once to direct attention to the general health, because in such cases an examination of the urine may lead to the discovery of diabetes. A state of poor health has always an unfavourable influence on the power of the ciliary muscle, and causes impairment of accommodation, which gives rise to difficulty in overtaking any form of close work and produces eye-strain, headache and general fatigue. The demands made upon the ciliary muscle are far greater than it can meet, and, consequently, the eye is in a constant state of physiological bankruptcy.

It is well-known that for comfortable vision it is necessary to have from one-third to one-half of the accommodation power, and nearly two-thirds of the convergence power, in reserve. Only for a very short time can the full energy of any muscle be exerted without fatigue, and if a muscle is to be used continuously for any length of time, there must always be a large reserve store of power. The ocular muscles form no exception to this law, which is the true key to the proper understanding of the various signs and symptoms associated with eye-strain. In these circumstances the client will usually say that he sees well in the distance, but that he is able to read only for a very short time. His difficulties are always increased if he tries to do close work in artificial light. The eyes soon get tired, the head aches, and the print becomes so confused that all effort to see has to be given up. After a rest the symptoms pass off, but no sooner is near work resumed than they reappear. If the sufferers can discontinue all near work and lead an open-air life, the eyes will give no trouble; but if circumstances compel them to follow the occupation of clerk, engraver, seamstress or such like, the symptoms of strain become constant; there is a feeling of weight in the eyelids, which are opened with great difficulty on first awaking in the morning; and in many cases the edge of the eyelids and the conjunctiva are chronically inflamed. In those who complain of such symptoms medical advice is usually required on account of the need for the use of drops to paralyse the ciliary muscle, because if only the manifest error of refraction be corrected, too much latent hypermetropia will remain, and perpetuate the patient's discomfort. If the patient be a child, convergent squint is not infrequently the first symptom noticed, and reveals the presence of hypermetropia which up till the appearance of the strabismus, had, in all probability, been quite unsuspected. It is always necessary to use a cycloplegic to determine accurately the error of refraction in children.

2. Those who cannot see in the distance, but who can see quite easily to read or to sew.

The client suffers from short sight—simple myopia. He has very indifferent vision for distance, but can read the smallest print, when he holds it near enough to his eye. Vision for distance is immediately improved by the use of a suitable concave glass. Contrary to the popular belief, which has always credited myopia with many advantages, the short-sighted eye contains within itself elements of disease, and must always be looked upon with suspicion, until time has proved it to be physiologically sound and trustworthy. No doubt there are many cases in which myopia amounts to nothing more than an error of refraction, and in which, apart from the inability to see distinctly in the distance without glasses, it causes no serious trouble; but, on the other hand, the myopia may steadily progress until the deeper structures of the eyeball are overtaken by incurable disease. No sharp line separates the two groups. The one passes by gradual and insensible gradations into the other; nor is it easy to determine why it is that in one person short sight remains stationary, while in another it increases to an alarming extent and terminates in blindness. The public should be made to understand that "myopia is always a defect and is often a disease" (Priestley Smith), and that its real nature can only be determined by careful and repeated examination of the eyes with the ophthalmoscope.

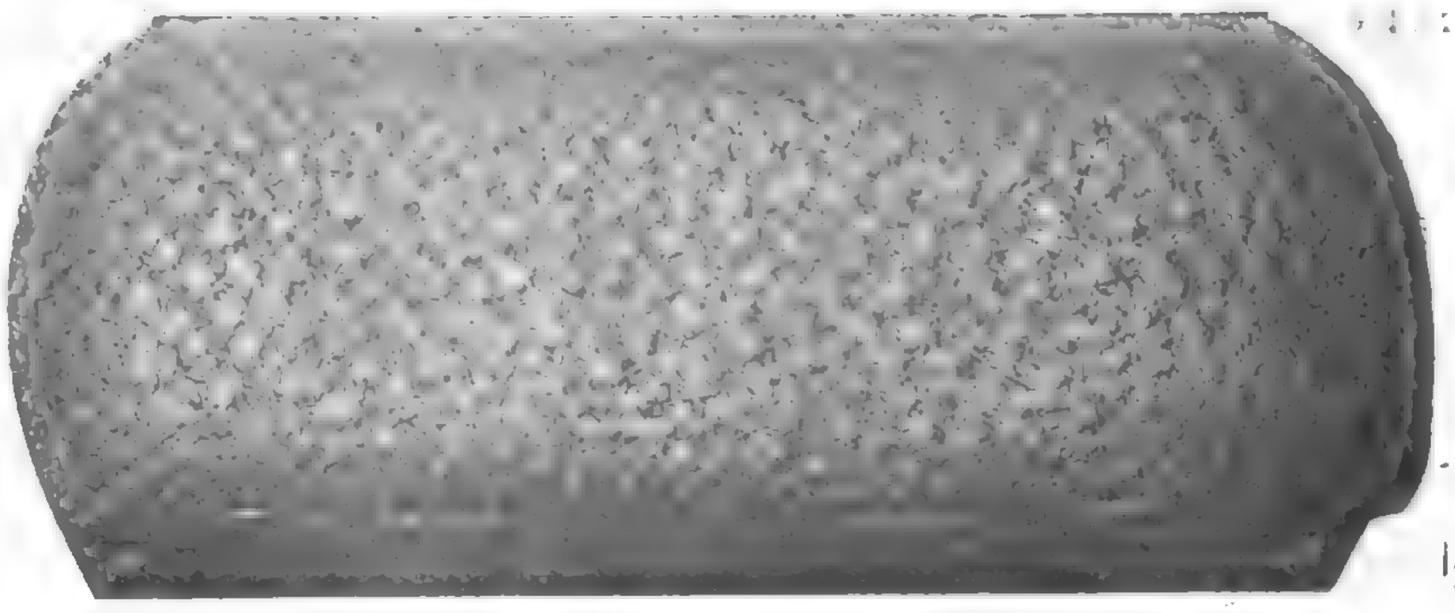
It is obvious, therefore, that the treatment of myopia cannot be summed up in a prescription for spectacles. It resolves itself largely into the best means of promoting the general health, as well as attending to the

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

"WERTEX"

WILLMOTTS'

LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.



11c 11c

Satisfy your client by selling him a specimen of your skill, and then gratify him by presenting him with a specimen of ours.

Use "WERTEX" Cases.

Details and samples from your dealer or direct from the manufacturers.

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

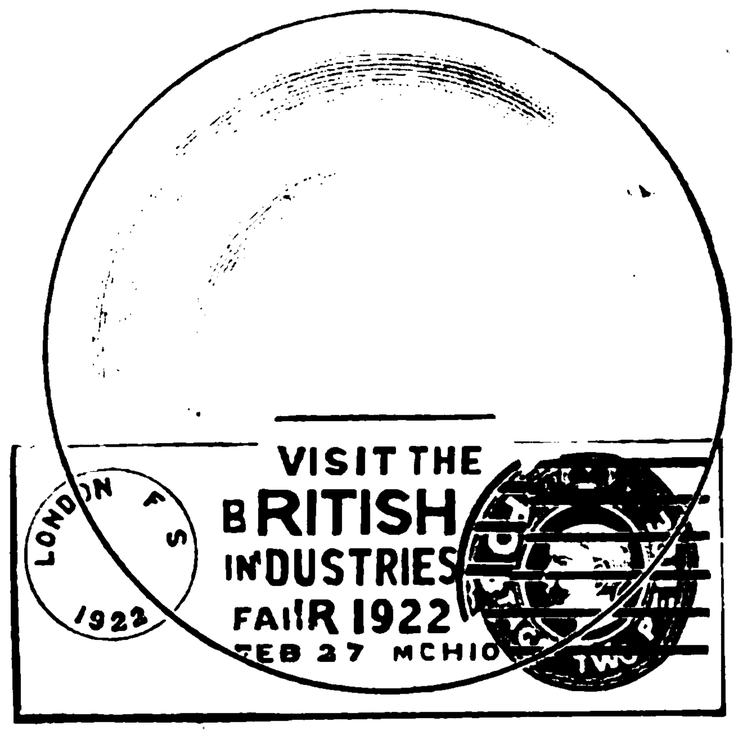
ENGLAND.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE "KOSTULES"

INVISIBLE is supplied Meniscus Only



BIFOCAL in Toric and forms by

LEVER BROS.,

The 24 Hours Rx Specialists,

18, HATTON GARDEN, E.C. 1

SAMPLE AND PRICE LIST SENT ON APPLICATION.

WHOLESALE TRADE ONLY SUPPLIED.



Write for Price List No. 2 and Samples.

LIZON & Cie.,

MOREZ DU JURA — FRANCE.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

local treatment. The serious intraocular changes which accompany progressive myopia often make considerable advances before they indicate their presence by any subjective symptoms which arouse the patient's concern; and in this silent progress lies the greatest danger. In the interest of the rising generation, therefore, there is nothing within the range of ocular hygiene of more importance than wise attention to those who suffer from short-sightedness.

Young persons, who have to use their eyes at fine work—engraving, embroidery, close study, etc.—for many hours on end, frequently complain that they cannot see in the distance. In them, however, the myopia is only apparent, and is due to spasm of the ciliary muscle. It is important to recognise those cases, because, if the true nature of the symptoms be misunderstood, the patient's discomforts will become steadily aggravated, and the apparent myopia will become real and progressive.

Spasm of the accommodation ought always to be suspected when a very weak concave spherical lens, *e.g.*, −.50D.S., improves the patient's sight far more than one would naturally expect—say from 6/18 or less to 6/6. There is, however, no fear of overlooking spasm, if the precaution be taken to paralyse the ciliary muscle before prescribing spectacles. The moment the accommodation is relaxed, vision for distance is improved, and both subjective and objective tests will in all probability, reveal a low degree of hypermetropia or of hypermetropic astigmatism. To treat such cases in young persons without a cycloplegic is as futile as to try to repair a watch while it is going.

3. Those who cannot see distinctly either in the distance or near at hand.

This class can be divided into three groups:

a. Those who suffer from astigmatism.

b. Those who suffer from a high degree of hypermetropia.

c. Those who suffer from insufficiency of convergence.

The correction of the error of refraction in all of these cases requires much skill, patience and experience, and the optician must always be on his guard lest the defective sight of which his client is complaining is due to a structural defect in the eye as well as to an error of refraction. The following simple test within the reach of all is most helpful. First discover by testing each eye separately which line of the test types the patient can read; then give him the black disc perforated by a pin hole from the test case, and ask him to hold it closely to one eye, the other being closed. If when he looks through the pin-hole, sight is materially improved, he is certainly suffering from an error of refraction, for had there been any want of transparency of the media, or any defect in the retina or optic nerve, sight would not be improved, but in all probability made worse by the pin-hole test.

When a patient feels the need for glasses he realises that there is something wrong, and in the majority of cases he expects the optician to be able to explain the meaning of his abnormal sensations. If the optician be a good listener he will be told often of peculiar defects of vision which he knows are not due to an error of refraction, and he will in many instances save his client from much trouble in the future by advising him to seek medical help at the earliest possible moment.

Typical Cases.

The following are some examples:—A patient often complains of seeing spots or specs—muscæ volitantes—but though these may give rise to much annoyance they do not as a rule, unless floating bodies be seen on ophthalmoscopic examination, indicate the existence of organic disease. Whenever they are dark in colour, however, so that the patient sees them in variable conditions of illumination, or when they are of large size and change their position with every movement of the eye, a careful examination with the ophthalmoscope is necessary, more especially if the patient is short-sighted. In these circumstances, opacities in the lens, or floating bodies, or hæmorrhages may be detected in the vitreous humour, or, most dangerous of all, the muscæ may be premonitory of detachment of the retina.

A mother may bring her child "to get spectacles" and will say in the course of conversation that he seems to see fairly well during the day, but after sunset he becomes so blind that if he happens to be out of doors he cannot see to find his way home. This symptom commonly called "night blindness" is almost pathognomonic of that progressive form of degeneration of the retina, known as retinitis pigmentosa, which sooner or later leads to complete loss of sight.

A man whose age is usually from forty to fifty may come to your office and say that for a considerable period his sight has been misty—so much so indeed that he has often experienced difficulty in reading ordinary type, and that he cannot get glasses to improve his

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

sight, which has suddenly become so much worse that he is now quite unable to read or write, and cannot even recognise friends when he meets them in the street. He may also add that he sees best in a dull light and that in sunshine he feels so much dazzled that he cannot see at all. If he is a golfer he will likely say incidentally that it puzzles him to know why it is that while he may be able to recognise the white flags on the greens he fails to see the red ones; if he happens to be a billiard player he is almost sure to complain that in certain positions he cannot see the red ball on the table. In such circumstances the trouble is, in all probability, due to excessive indulgence in tobacco or alcohol or both; and careful medical examination will in most instances confirm that opinion.

It occasionally happens that a patient complains that every object looked at is altered in size, or is thrown out of proportion and distorted. This symptom is known as metamorphopsia and is often of very serious import. This distortion may of course be due to errors in the optical construction of the eye; but it is more likely to be induced by pathological changes in the retina itself, and is then significant of grave disorder of vision, and usually symptomatic of inflammation of the choroid, of hæmorrhage from the retinal blood vessels or of detachment of the retina. It is caused by a change in the relative position of the cones in the macula—the central area of the field of vision. In some instances where the percipient elements of the retina are separated by exudation, objects appear too small (micropsia); in others where the percipient elements are crowded together owing to cicatricial changes, they seem too large (macropsia); and in still others they assume very irregular shapes. The face of a friend is so distorted that it is hideous to behold; the letters in a line of print appear at different levels and are irregularly spaced; the lamp-posts, as seen when walking along the street seem as if they had been broken and joined together at an angle; everything looks as if it were seen through a window against which a stream of water is constantly playing, *e.g.*, the window of a fishmonger's shop, etc., etc. It is sometimes difficult to detect with the ophthalmoscope the pathological changes that give rise to metamorphopsia, and hence the value of the symptom in leading to a correct diagnosis.

Other examples might be given but sufficient has been said to direct attention to the subject. The symptoms referred to are very liable to be disregarded by the patients themselves, consequently it is the more necessary that the optician be quick to appreciate, and appraise at their proper value any remarks regarding eyesight, seemingly trivial, but often in reality of the gravest significance, made by a client in a most casual manner, while he is buying a pair of spectacles. If by directing attention to the subject in this lecture, I have helped to a better understanding of these matters, my object will have been attained.

Planetary Motions and the Einstein Theories.

A Possible Alternative to the Relativity Doctrines.

By Prof. CHARLES LANE POOR, Columbia University.

The entire Einstein theory of the universe is based upon two or three pure assumptions as to the fundamental constitution of nature. These are so broad and general in character that they cannot be directly tested. But, if they are provisionally accepted as true, it is possible to build upon them a complete and logical theory of the universe and of the laws governing the motions of all the bodies therein. This Einstein has done with great technical skill, with results that are remarkable and, to say the least, very startling to our preconceived ideas of space and time. It is through these results, through the logical deductions and formulas derived from his postulates, that the hypotheses themselves can be tested.

In order, however, to establish the Einstein theories it will not be sufficient to show that the facts of nature can be explained by the Einstein formulas; it must be conclusively shown that no other hypothesis will equally well explain the observed phenomena. In the words of the mathematician, it is essential for the followers of Einstein to show that his hypotheses and formulas are *necessary and sufficient*.

For many years the Newtonian law as applied by mathematicians has failed to account accurately for the motions of Mercury, and

Digitized by Google Original from THE OHIO STATE UNIVERSITY

GEORGE CULVER LTD.

Manufacturing Opticians

JOBBING AND PRESCRIPTION WORK

ACCURACY, NEATNESS,

PROMPTNESS

Large and full stocks of English made Frames and Lenses of all combinations.

ORDERS CAN BE EXECUTED PROMPTLY.

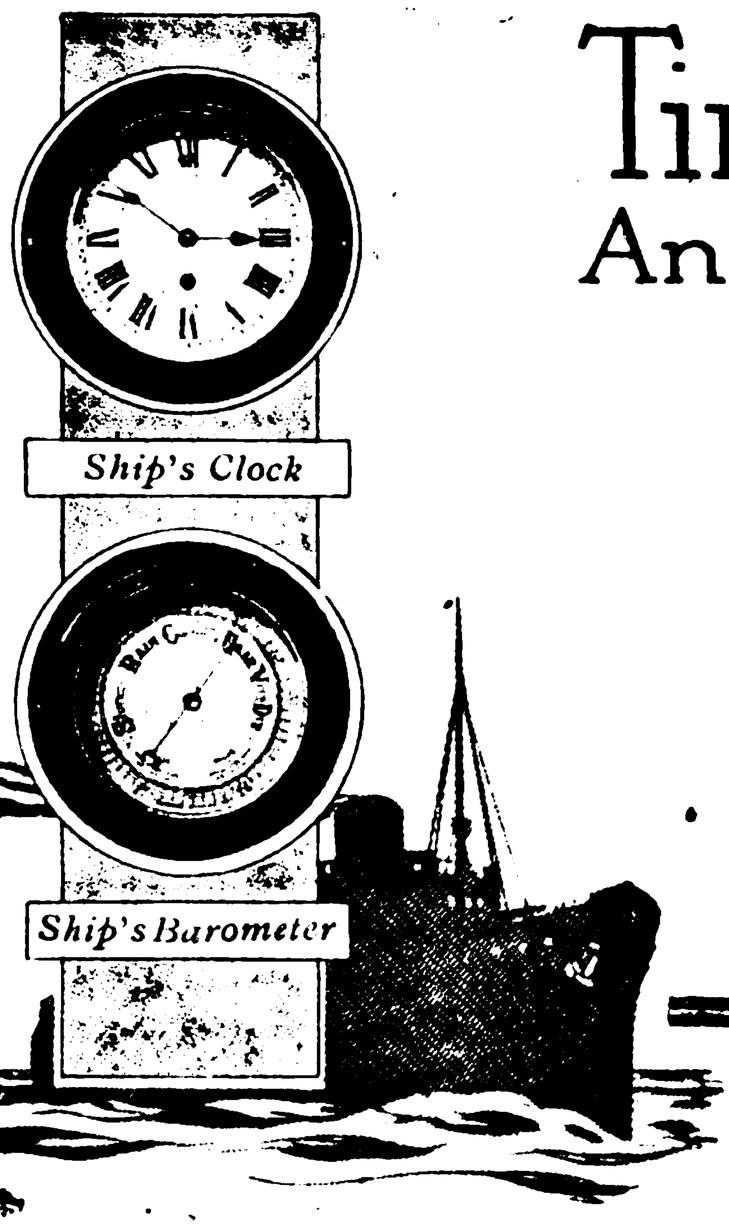
WHITE LION STREET
PENTONVILLE
LONDON. N.I.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

T. A. R. & Co.

"THE ALL BRITISH HOUSE."

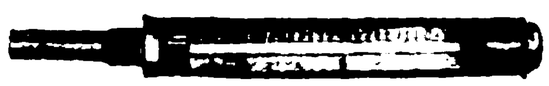
Over 2,000 Designs in Aneroid Barometers.



Time and Tide
And Ship's Instruments



T.A.REYNOLDS & Co
40-1-2 PERCIVAL STREET,
LONDON E.C.1



Steam-pipe Thermometer



Hydrometer

Telegrams—
"THERBAROME. LONDON."

Telephone
339 CITY.

Showrooms and Offices at above address.

If you are a Retailer and need ORIGINAL LINES in Barometers, Clocks and Thermometers, write us, and although we will not supply you direct, we will put you in touch with the Nearest Wholesale House.

WHOLESALE AND SHIPPING TRADE ONLY.

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

this failure has been made the basis of many attacks upon the Newtonian law, of which Einstein's is merely the latest and best executed. The orbit, or path, of any planet, such as Mercury, about the sun is an immense oval, or ellipse, one diameter of which is longer than the others. This diameter is known as the axis of the orbit. Now, if Mercury were the sole planet in the system, then, under the Newtonian law, this axis would remain fixed in direction; but, under the Einstein law, it would rotate slowly at the rate of 43″ of arc per century. Under such conditions a clear cut issue would be presented, and observations could at once decide between the two theories.

A Striking Agreement of Figures.

Mercury, however, is not the only planet, and the action of the earth and the other planets upon him causes a similar and a much larger rotation of the axis, the exact amount of which can be found only after long and complicated computations. These calculations give 537″ per century, and, if the Newtonian law be exact and the *computations correct in every particular*, the axis of Mercury's orbit should rotate by this amount. Direct measurements upon the positions of the planet in the heavens, however, show this rotation to be 579″, or an excess of 42″ over the amount yet accounted for by the Newtonian law, and in extremely close accord with the rate of motion predicted by the Einstein formulas.

At first sight this striking agreement of figures appears to confirm the Einstein theories in a brilliant manner. But, striking as these figures are, the confirmation is not complete, for it is possible to explain the motion of Mercury in full accord with the Newtonian law and in accordance with accepted scientific facts.

The whole matter depends upon the calculations through which the figure 537″ was found. Now it is well-known to every mathematical astronomer that these calculations are not complete, that they do not take fully and completely into account all of the bodies of the solar system. In the theories and formulas upon which these calculations depend the sun has been considered as a perfect sphere and all space between the sun and the various planets as free from all gravitational matter. These are necessary mathematical simplifications: Without them the equations of motion would be impossible of solution. These simplications approximate very closely to the truth and the results obtained by their use very closely represent the motions of the planets, but they are *approximations* and it necessarily follows that the results do not represent the actual motions with complete accuracy.

Every photograph taken, every measurement made of the sun and the various planets show that these assumptions, upon which the simplifications are based, are not true. Neither the sun nor any one of the planets is a perfect sphere. The polar axis of the earth is considerably shorter than the equatorial; a glance through any telescope shows Jupiter to be decidedly elliptical. The sun-spots, which can be seen with an ordinary small telescope, show that the sun is not of uniform shape and density. Exact measurements of the shape of the sun are extremely difficult to make, yet every series of measures, heretofore made, show distinct departure from a true spherical form.

Passing outwards from the sun itself one finds the corona. At times of eclipse this halo, or brilliant crown about the sun, can be seen by the unaided eye. It has been sketched many times, it has been photographed times without number. Its presence proves the sun to be surrounded by an envelop of matter of irregular shape and of vast size. This envelop is in general lens-shaped and it extends far out beyond the orbit of the earth.

The exact size, shape and constitution of this envelop is not known; its density is extremely small and the total amount of matter contained in it cannot be very large. It is known, however, that it is not a true gaseous atmosphere of the sun like that of the earth. It consists, in the main, of widely scattered, minute solid particles, each travelling about the sun in its own independent orbit. Some of these bodies may be as small as pin-heads, others many feet in diameter. The zodiacal light is recognised as mainly sun-light reflected from such minute bodies, each too small to be seen separately, but, as a group or mass, reflecting enough light to show as a faint glow against the dark sky.

Arguments to the Contrary.

While matter is thus known to exist in the vicinity of the sun and the inner planets, its effect upon the motions of these planets cannot be absolutely calculated until its distribution is fully known. It is clear that the figure 537″ per century does not accurately represent the motion of Mercury's perihelion under the Newtonian law; but, in the present state of our knowledge of the solar envelop, it is impossible to correct definitely this figure and to state what the final value should be.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Further, the discordance in the motion of Mercury is only one out of eight or ten similar discrepancies in the motions of the planets. Einstein and his followers have stressed the supposed explanation, under his theories, of the motion of Mercury, but have glossed over the necessity of finding an explanation for the remaining discrepancies. Now the theories and formulas of Einstein account partially for one or two of these other difficulties, completely fail to account in the slightest way for others, and finally greatly increase the discordance in the case of Venus. In fact, in the case of this planet, the Einstein formulas would give the orbital rotation in the opposite direction to that which is required to fit the observations.

According to Newcomb the secular motions of the elements of the four inner planets, as observed and as computed, are as given in Table I. The column of differences contains the unexplained portions of the motions of the planets. That is, in one century the perihelion of Mercury moves 41.6″ of arc more than can be accounted for, while that of Venus does not move quite so swiftly as the computations would lead one to expect. These unexplained portions of the motions are the so-called "discordances" or "discrepancies." That of the perihelion of Mercury is especially well-known and has figured prominently in many attempts to prove false the law of Newton. The perihelion of Mars shows a large discrepancy, as do also the nodes of both Mercury and Venus.

In the column of differences, after each discordance, is given the "probable error" as determined by Newcomb. While these may give some idea as to the relative accuracy of the various determinations, it must be remembered that the assignment of these probable errors is very largely a matter of judgment, and that the values may have been over or under estimated. In every step of the long and complicated computations and reductions, an estimate, rather than an exact calculation, has to be made as to the value of the probable error, and the final value, as given in the table, thus depends upon many separate estimations or judgments. But, taking these probable errors as given by Newcomb, it will be noted that out of the ten differences six are larger than the corresponding probable errors, and of these six, three stand out prominently: The perihelion of Mercury, the perihelion of Mars, and the node of Venus.

The final column in the table gives the percentage that the discordance bears to the observed motion. While this is rather an unusual way of comparing results, it may be of interest and may throw some light on the problem. It will be noted that five of the differences represent very large percentages of the observed quantities, and of these five, three are among the six that exceed their probable errors. These three are in the motions of the perihelion of Mercury, the inclination of Venus, and the node of Mercury.

The discordance in the perihelion of Venus is peculiar. It amounts to over 17 per cent. of the entire observed motion, and yet it is only one-third of the apparent probable error. It would seem that where the percentage is so large, the discordance must be real, and that the value of the probable error has been overestimated.

According to the Einstein theory, as noted above, the perihelia of the planets would rotate by various amounts depending upon their respective distances from the sun. This

TABLE I.

	Obsd.	Compt.	Diff.	Plus or Minus	P.C.
PERIHELIA:					
Mercury.....	+ 579·2″	+ 537·6″	+41·6″	1·4″	+ 7·2
Venus	+ 42·4	+ 49·7	− 7·3	22·3	−17·2
Earth.....	+1161·5	+1155·6	+ 5·9	5·6	+ 0·5
Mars	+1605·9	+1597·8	+ 8·1	2·6	+ 0·5
INCLINATIONS:					
Mercury.....	+ 7·14″	+ 6·76″	+0·38″	0·54″	+ 5·3
Venus	+ 3·87	+ 3·49	+0·38	0·32	+ 9·8
Mars	− 2·26	− 2·25	−0·01	0·14	− 0·4
NODES:					
Mercury.....	− 753·0″	− 758·1″	+ 5·1″	2·8″	+ 6·8
Venus	−1780·7	−1790·9	+10·2	2·0	+ 0·6
Mars	−2248·9	−2249·8	+ 0·9	4·6	+ 0·0

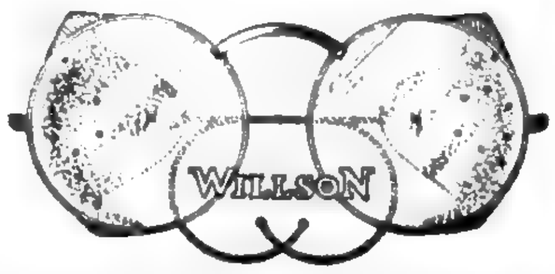
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

WILLSON
GOGGLES
REG. U.S. PAT. OFF.

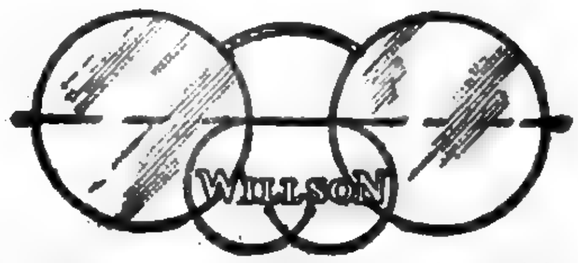
Trade Mark Registered and Patents Applied For in Leading Countries.

WILLSON GOGGLES INC., READING, PA., U.S.A.

The following goggles are furnished with micoquille lenses in amber, fieuzal, smoke or clear.



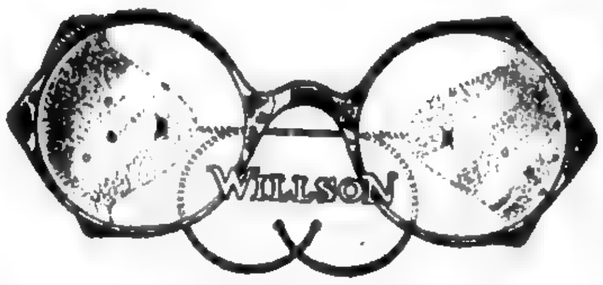
No. A1. Adjustable bridge, cable temples, leather sides and screw joints. Metal case.



No. W5. Mydriatic glass, adjustable bridge. Smoke lenses only. Cable temples. Can be worn over other glasses.



No. Z21. Good quality imitation shell front. Cable Temples. Cardboard box.



No. Z1. Good quality imitation shell front, leather sides, and cable temples. Flat metal case.



No. 1. Dustite Respirator, dry filter type. For protecting the lungs, nose and mouth from all kinds of dust and poisonous, irritating spray. Fits anybody. Parts replaceable,

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

DUPAUL, YOUNG OPTICAL CO.,

SOUTHBRIDGE, MASS., U.S.A.

The "ONLIWON" GOLD FILLED INNER RIM ZYLO FRAME.



WE claim we have the ONLY ONE of this class of frame that is scientifically and mechanically perfect in construction.

The most important feature of the "ONLIWON" FRAMES is, the way outer Zylo rim is drawn and closed over the gold filled inner metal rim by a mechanical process known as "crimping," which means curling, turning, drawing, pressing, squeezing. Burnishing one over the other by heat and pressure, thus firmly clamping it securely to the now imbedded inner metal rim, without screws, rivets or clamps.

"ONLIWON" Frames can be formed to any desired shape of eye without the two rims separating.

"ONLIWON" Frames have thin, inconspicuous rims and are not clumsy or showy.

All our Bridges have a Rounded Base at Shank.

Which absolutely prevents the Breaking or cracking of the gold shell of the filled metal during the process of shaping them to size, which is distinctly a Dupaul, Young Optical Company feature on all our frames.

The special KANTFEEL TEMPLES used on "ONLIWON" FRAMES are so made as to almost totally eliminate their breaking at the end-piece.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"BISHOP EYEGLASS CHAINS"

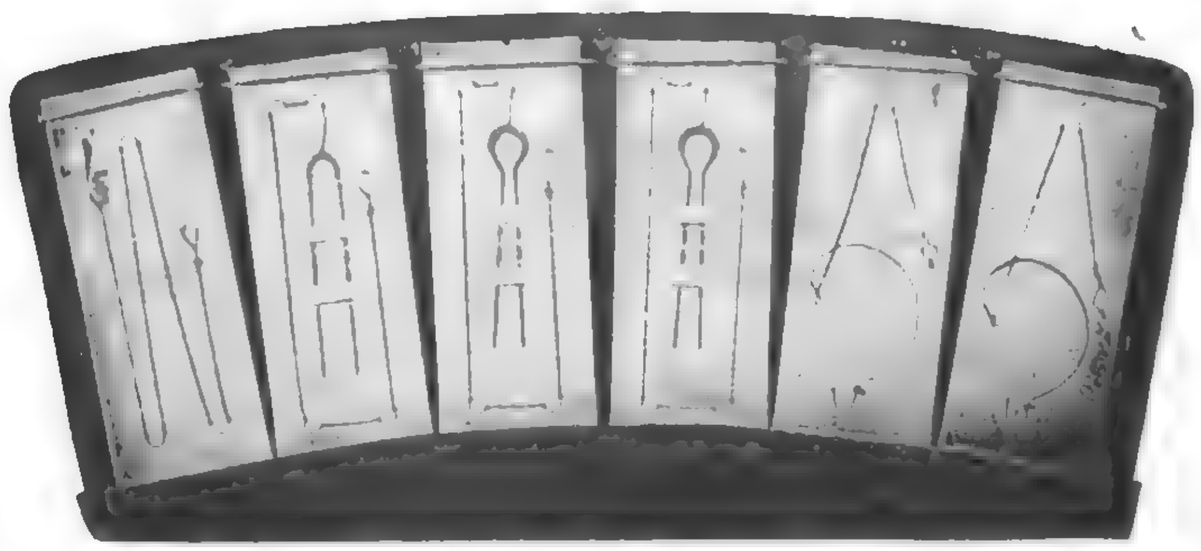
In Gold and Gold Filled

ALSO

SILK EYEGLASS & MONOCLE RIBBONS

are well known to the OPTICAL TRADE and have always been known to give satisfaction. Quality and Finish are evident in all goods of Bishop manufacture and the Bishop trade mark on all chain cards and boxes is your guarantee of absolutely dependancy.

Avoid substitutes, let "BISHOP CHAINS" be your standard of Quality.



THE BISHOP COMPANY,
North Attleboro, Mass.,
U.S.A.

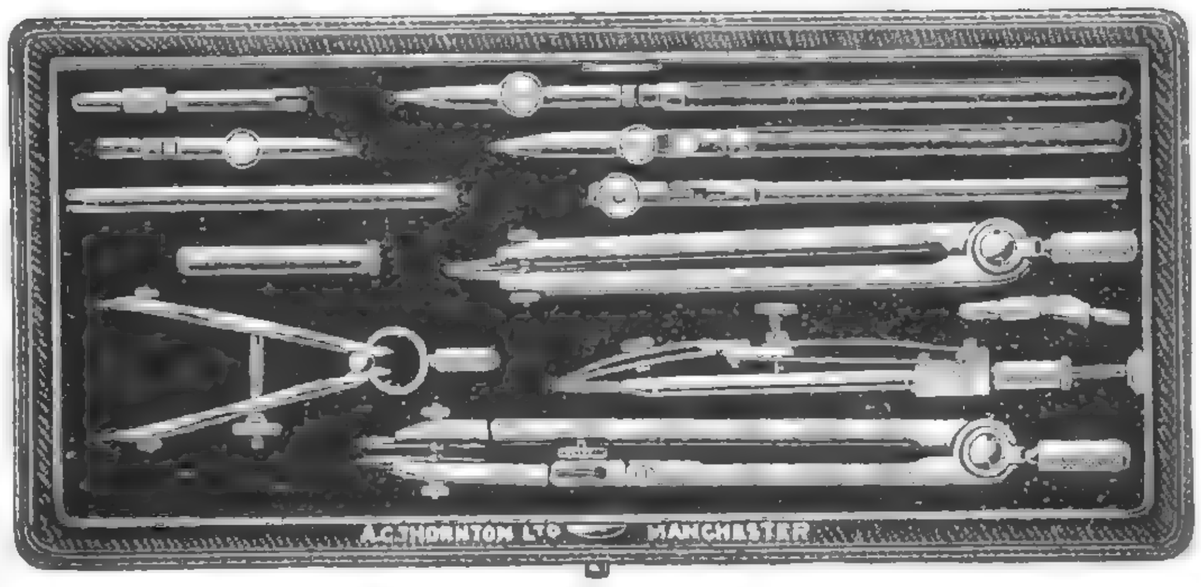
To be obtained from all Wholesale Optical Houses.

LONDON OFFICE S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

BRITISH MADE DRAWING INSTRUMENTS



Pocket case of Show Instruments, from 18/9 each.

SPECIAL TERMS TO THE TRADE.

Produced in our Factory at Manchester.

A. G. THORNTON, LTD.

Contractors to the British, Colonial, and other Governments.

PARAGON WORKS,
20, KING ST., WEST,
MANCHESTER.

Rx

SANDRO LOWY

Optical Rx Specialist,

88, Goswell Road,

LONDON, E.C. 1

Telephone: CITY 384 (two lines)

Telegrams: SANOPTIC, LONDON.

Rx

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Einstein rotation is independent of the mutual action of the planets upon one another, and in order to find the total motions under the Einstein theories, it should be added to the computed motions as given in the above table. This is shown in Table II., which also gives the final outstanding differences between theory and observation, as based upon the Einstein theory.

TABLE II. (Perihelia).

	Newtonian Computation	Einstein	Total	Diff.	P.C.
Mercury.....	537·6″	42·9″	580·5″	− 1·3″	0·2
Venus	49·7	8·6	58·3	−15·9	37·5
Earth	1155·6	3·8	1159·4	2·1	0·2
Mars	1597·8	1·3	1599·1	6·8	0·4

Thus the Einstein motion is sufficient to account for practically all the discrepancy in the case of Mercury and to reduce in a marked manner that in the case of the Earth. It accounts, however, for a very small part of the discordance in the case of Mars, and more than doubles the already large discrepancy in the motion of Venus. Further the Einstein law does not in any way account for the important discrepancies in the motions of the nodes and in the inclinations of the planets.

Turning now to the matter which is known to exist in the vicinity of the sun and planets, while as we have said we cannot determine its quantity and general distribution, it is perfectly possible and reasonably easy to find what distribution of this matter would under the Newtonian law, give a motion of 42″ to Mercury's perihelion, and thus make the total motion 579″, as required by observation. This problem is similar to that solved by Adams and Leverrier, which resulted in the discovery of the planet Neptune. Moreover, it is then found that the distribution that will explain the motion of Mercury will fully explain that of the other planets; it will give the orbit of Venus the necessary rotation, both in direction and in amount. What the Einstein formulas fail to explain, the presence of a great lens of matter about the sun explains fully and satisfactorily.

The quantity of matter required in the solar lens for this purpose, and the distribution which it becomes necessary to assign to it, are entirely within the limits of reason. The matter in the immediate vicinity of the sun would tend to group itself about a plane somewhere near that of the solar equator, or that of the orbit of Mercury; while matter at a considerable distance from the sun would tend more towards the invariable plane of the solar system, which is nearly the same as that of the orbit of Jupiter. Further the density of the matter will decrease as the distance from the sun increases. This general distribution can be approximated by assuming the whole mass to be made up of ellipsoids of revolution, each ellipsoid of uniform density, but the larger ones of much less density than the inner ones. Some such assumption is necessary to reduce the problem to the realm of figures; the selection of ellipsoids of revolution is naturally indicated by the fact that all the known bodies of the solar system are such ellipsoids.

For purposes of computation the mass may be supposed to be made up of superimposed ellipsoids, each of constant density. This merely makes the changes in density abrupt, instead of gradual. Three such ellipsoids are necessary and sufficient to account for the motions of the perihelia of the four planets.

(*a*) A small central ellipsoid entirely within the orbit of Mercury, and embracing only the matter in the immediate vicinity of the sun. The position of this ellipsoid in space was determined from equations of condition derived from the discordances.

(*b*) An intermediate ellipsoid entirely within the orbit of the earth, but extending beyond the orbit of Venus. The principal plane of this ellipsoid was assumed as being the same as that of the orbit of Jupiter.

(*c*) An outer ellipsoid entirely within the orbit of Mars, but extending beyond the orbit of the earth. The principal plane of this ellipsoid was assumed as being the same as that of the orbit of Jupiter.

The mass, or density, of each ellipsoid is a function of its radius and cannot be independently determined. The radii can, however, be assumed arbitrarily and the corresponding masses and densities found. With an assumed ellipticity of 0.9 and assumed radii we have:

	Assumed radii	Correspond'g densities
Inner ellipsoid.....	0·05	$1·2\times10^{-7}$
Medium ellipsoid.....	0·98	$1·7\times10^{-18}$
Outer ellipsoid	1·36	$7·4\times10^{-14}$

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

where the density of the sun is unity. If the inner ellipsoid be assumed to be of larger radius, then its density would be correspondingly less.

With the assumption thus outlined, the motions of the planets were calculated. The results appear in Table III.

The relative probabilities of two solutions of a problem are usually determined from the final differences or residuals, as these differences are called. That solution is deemed the most probable which makes the sum of the squares of the residuals the smaller. If this test be applied to the residuals obtained in Table II. with the Einstein theory as the basis and to those from Table III., the results are:

Einstein Theory .....438·38
Solar envelop ..... 14·07

And these clearly indicate how very much more probable is the explanation of the motions of the planets as due to the presence of matter in space, than by the hypotheses of Einstein.

TABLE III.

	Motion due to Solar Envelop	Total Motion	Final Diff.
PERIHELIA:			
Mercury.....	+41·6″	+ 579·2″	0·0″
Venus.....	− 7·5	+ 42·2	+0·2
Earth.....	+ 5·9	+1161·5	0·0
Mars	+ 6·9	+1604·7	+1·2
INCLINATIONS:			
Mercury.....	+0·37″	+ 7·13″	+0·01″
Venus.....	+0·45	+ 3·94	−0·07
Mars	+0·12	− 2·13	+0·12
NODES:			
Mercury.....	+ 4·9″	− 753·2″	−0·2″
Venus.....	+ 9·1	−1781·8	−1·1
Mars	+ 4·3	−2245·5	−3·4

Einstein and his followers have cited the motions of the planets as conclusive proof of the truth of his hypotheses. The evidence does not sustain this—his hypotheses and formulas are neither *sufficient* nor *necessary* to explain the discordances in these motions. They are not *sufficient*, for they account for only one among the numerous discordances—that of the perihelion of Mercury; they are not *necessary*, for all the discordances, including that of Mercury, can readily be accounted for by the action, under the Newtonian law, of matter known to be in the immediate vicinity of the sun and the planets.

Thus the motions of the planets do not prove the *truth* of the Einstein theory, nor, on the other hand, do they prove its *falsity*. While these motions can be accounted for by a certain distribution of matter in the solar envelop, it has not yet been established by observation that the matter is distributed through space in the required way. In the present state of our knowledge regarding this matter, the motions of the planets do not and cannot furnish a definite answer to the question as to the validity of either hypothesis. It is then a problem of observational astronomy to investigate the actual distribution and density of the matter in the solar lens, and to determine whether or not it approximates the conditions necessary to account for the planetary motions. In 1908-10, before Einstein had developed his astronomical theories, I called attention to the desirability of doing this; but the astronomical world could not see the need of the investigation and it was never made.

Retail Prices—and Protection.

The 'Daily News,' one of the leading organs of the free-traders, publishes an anonymous letter as follows:—"May I state how the Key Industries Act works in the case of lenses for eyeglasses?

"Dec., 1920, a special lens ... 7s. 0d.
"Dec., 1921, ditto ... ... 10s. 3d.

"These lenses were bought from the same firm for the same pair of eyeglasses (left eye). In reply to a request for the reason of the large increase I was told that 'before the war the majority of best quality optical lenses were imported from France and America, but now the manufacture of these lenses is being done more extensively in England, and has been made a key industry, and an import duty of 33⅓ per cent. has been placed on all lenses imported. You will therefore see that we have no alternative but to increase our prices. We can assure you that it would not be to our interest to increase prices without good reason.' Thus the import duty of 33⅓ per cent. becomes an extra charge of 16 3-7 per cent. to the consumer. Comment is needless."

This visiting the sin—if sin there be—of the retailer on the manufacturer, is amusing. However we shall not make it our business to analyse the figures, as their significance is obvious to anyone familiar with the course of trade. As an illustration of how party politics

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

IT COMPELS ATTENTION.

The "GENOCO" Electric Flashing Window Sign.

Brings increased business to the Optician.



Size 13" x 11" x 9"

This sign is designed for use inside the Optician's window, and is supplied complete with 4 interchangeable Framed Opal plates.

The plate shown in the illustration is in 2 colours, for when the plate is illuminated from the back, the words, "If so, Consult us" shew up in red lettering inside the question mark.

The other plates are in black and red lettering on opal, and worded as follows:

"Repairs to Spectacles and Eyeglasses quickly executed."

"Oculists' Prescriptions carefully filled."

"The Best is always the cheapest in the end. Crookes lenses are the acme of perfection. Wearing these ensures comfort."

One unique feature of this sign is in the fact that when the plates are not in use on the sign, they can be hung up round the waiting room or shop, to continue their work of impressing their message.

Wired for any voltage. Special plates can be made to order.

Price on Application to

THE GENERAL OPTICAL Co. (E. T. & F. W. Cornwell),

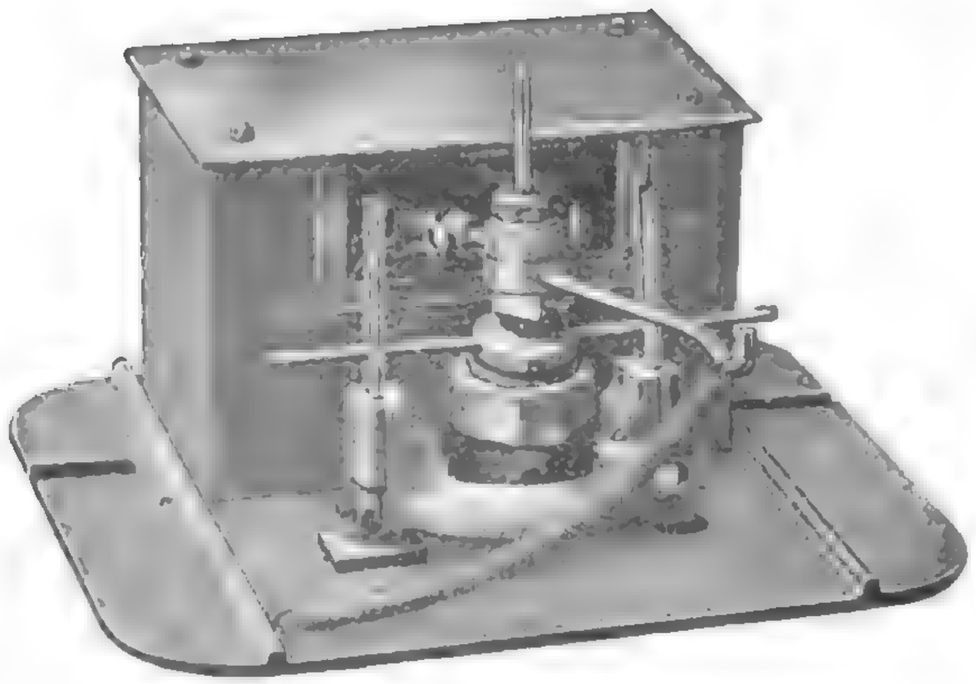
31 & 32, ELY PLACE, HOLBORN, LONDON, E.C. 1

Telephone: 615 HOLBORN. **Telegrams: GENOPTICO, SMITH, LONDON.**

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

"SOMCO" Auto-Surfacing Machine.

British Industries
FAIR,
WHITE CITY,
February 27th—
March 10th.
OUR STAND
E18



The "SOMCO"
Demonstrated
in operation at
OUR STAND
E18

Telephone :
HOLBORN 2139

Telegrams :
SUROPTO,
SMITH, LONDON.

PLEASE NOTE CHANGE OF ADDRESS—

SURGICAL & OPTICAL MFG., Co.,

~~22, Union Road, Clapham. S.W.4~~

35, CHARLES STREET,
HATTON GARDEN,
E.C.1

UNCUT LENSES

OF EVERY DESCRIPTION

QUALITY AND PRICES DEFY COMPETITION

WRITE FOR OUR

LATEST PRICE LIST

OUR RX DEPARTMENT IS UNEQUALLED FOR

PROMPTNESS & ACCURACY

Telephone:
HOLBORN 1820
(Private Exchange).

KIRK BROTHERS
WHOLESALE & MANUFACTURING OPTICIANS

Telegrams:
KIRBROREX, HOLB.
LONDON.

36, GRAY'S INN ROAD, LONDON, W.C.1

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

are purveyed to the people, in connection with the great free *versus* fair trade controversy, this letter is good.

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

Cardinal Points of Lens Systems.

Sir,—It may be of interest to point out that the theorem given by Dr. G. F. Alexander in *The Optician*, of September 12th, 1918, relating to the cardinal points of a system of centered spherical surfaces together with the simpler proof given on January 27th last, based on the incidence-heights at successive surfaces, is to be found, though with a slightly different notation, in M. Von Rohr's "Geometrical Investigation of the Formation of Images in Optical Instruments," English Translation, pp. 142-3.

J. A. Tomkins.

Wesley Villa, Bramley, Leeds.

Workshop Risks.

Sir,—The letter from "Prevention" will be of interest to all lady optical mechanics. As it is a difficult proposition to guard all dangerous points of optical machinery, I beg to remind lady workers and their employers that during the war lady munition workers wore caps, like bathing caps. This kept the hair clear and free from danger.

J.M.W.

The Proposed Optical Panel.

Sir,—May I suggest that "Unorganised and Non-Diploma Holder" in your issue of the 3rd, is doing the optical profession a disservice in urging the claims of unqualified opticians as a class at the present time, for panel service?

They are such a mixed lot that if the door were opened to them, he would find himself accompanied by many men who would not be able to tell him what a sphero-cyl. lens was; and U.N.D.H. would in that case have a legitimate grievance.

For the future welfare of our calling, we must keep inefficiency out of any national panel service; and the only way to ensure this is to restrict the work to qualified opticians —to start with, at any rate—there will be opportunities of remedying real cases of injustice once the project gets on its feet.

Nigger.

Sir,—If your "unorganised" correspondent in last week's *Optician* knows his business; he will not find any very great difficulty in passing one of the examinations. It would mean study and expense, etc., but this is what all qualified men have had to go through, and it would hardly be fair to put him on the same level as them.

Even if he has not sufficient ability to pass an examination, he can still become organised, and get a membership card for show purposes, which looks very much like a diploma.

Pat.

A Complaint of Party Politics.

Sir,—The miserable wrangles of domestic politics in some of the more familiar sorts, resolve themselves into a hundred little class wars, that the parties may best be left to fight out and ultimately adjust by compromise between themselves. Here Government interference stands at a discount, and should be limited to barring an extreme and socially dangerous use of the economic weapon against labouring masses. But compromise which is reasonable in localised class wars of capital and labour, or of producers and distributors or distributors and customers, has not the same value in the field of national politics, where the aim of our statesmen is supposed to be "the greatest good for the greatest number." In the multitude of petty disputes between employers and employed, manufacturers and traders, traders and consumers, we see the higgling of the market, which given proper freedom, will result in "averaging out" the just dues of the contestants.

In the policy of national finance, on the other hand, there is a less unrestricted proper field for compromise. Yet here the hopeless Coalition Government is swayed by contrary winds of doctrine—pull banker, pull trader. In financial unsettlement and uncertainty is commercial decline. And in a settled policy of finance it is obvious one or other of the only two opposing interests must be dominant.

The bankers, as deflationists, have arrayed behind them the holders of fixed interest bearing stock, and on the other hand the manufacturers and traders have arrayed behind

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

them, because bound up with the same interests, the great number of wage earners, both professional and manual, and the mass of consumers of merchantable goods. Which of these two classes is the greater number, and which of them is more important to our national prosperity? Admit that there is overlapping. But a producer or a trader who invests his profits in gilt-edged stock instead of venturing them in the development and extension of his business, is hardly the best pillar of commercial strength. Yet in spite of its obvious and great importance, we observe that neither of the political parties has a clearly defined policy on the money question. It seems to be just like the fiscal question, befogged by political leaders whose personal interests or aims are undisclosed, and whose professions are trimmed to flatter uninformed public opinions. The effect of the uncertainty that results is trade stagnation and national impoverishment. But our placemen still prefer the easy appeal to popular prejudices, rather than facing logical issues which are really vital to the body politic. So we find party cries are more concerned with such trifles as the hour of closing places of refreshment, and what time people should go to bed.

AN OPTICAL WAGE EARNER.

"Keen-Eyed" Professions.

Under this heading, the following correspondence, of some popular interest, appeared in the 'Evening News' of Thursday and Friday last week:—

"Pince-Nez" wrote, "In these days when we find that nearly every second person one meets is wearing glasses it is interesting to note how certain classes of individuals nevertheless seem to be immune from this defect. For instance, one hardly ever sees a waiter with glasses (at least, not on his face). Again, I never remember having seen a 'bus conductor in spectacles, horn-rimmed or otherwise. Is it that these occupations are, from an ocular point of view, healthy ones, or merely coincidence."

Mr. Geo. H. Kent remarks that "Generally speaking, ocular defects are just as common with manual labourers as with other people, such as clerks and typists,, who use their eyes constantly for near work. Small errors which would not bother a roadmender are frequently a source of much strain and discomfort to those whose work involves sustained focusing for near objects, and glasses are very often prescribed and worn for the relief of headaches, even though in some cases they do not improve visual acuity. I know a waiter who has a considerable defect, but who is not permitted to wear his glasses except when 'off duty.' This is doubtless the reason why many such individuals are erroneously supposed to enjoy good vision."

Mr. Morley Dainow, a lecturer on psychology under the London County Council, says':—"'Pince-Nez' might as well suggest that the work of a policeman is conducive to healthy eyesight; but the real cause for this is the health of the man before he joins the force. The same applies to many other jobs. It may interest your readers to know that as a result of many years' psychological experiments I have found that Civil Servants as a profession are the most observant with their eyes."

Mr. S. Marchant writes:—"As an optician I can assure your correspondent, 'Pince-Nez,' that there are quite a few omnibus conductors who wear eyeglasses. I myself have several on my books; secondly, 50 per cent. of those who wear eye-glasses use them for reading only."

Kirk Brothers Staff Dance.

We are informed that Messrs. Kirk Brothers' Staff Dance, which took place at the Finsbury Town Hall, on Monday last, the 6th inst., was a very great success. Among the visitors present were representatives of the staffs of practically all the wholesale optical houses, including The American Optical Co., Raphaels, Flemings, Williamsons, Thompsons, Mills, Newbold & Co., General Optical Co., London Optical Co., Archers, Lyons, Lever Brothers, Uni-Bifocal and Wiseman & Co. The organisers of this dance, Messrs. H. & H. Arnold, wish to offer their apologies to those patrons who could not be admitted owing to the large number already present at the early part of the evening, and hope to be able to make amends to all concerned in the near future.

New and Second-Hand Optical Instruments.

Again enlarged, a new classified list of second-hand scientific instruments (No. 74) has just been issued by Messrs. C. Baker, of 244, High Holborn, London, W.C.1., and copies will be sent to any of our readers on request. This very useful little work of reference (containing over 80 pages) covers practically the whole of optical and photograhic apparatus; and the prices are in most cases quite remarkably advantageous. Not

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Seven Styles

now made in

"OCENTRIC"

EYEGLASSES

BRITISH MADE.



A Distinctive Model for Each Individual Taste.

RIMLESS MOUNTS & FRAMES. G.F. & SOLID GOLD.

0 series Short Plaquets Regular pattern
100 „ Normal Plaquets Regular Pattern
200 „ Long Plaquets Regular Pattern
300 „ For Centrally Drilled Lenses
(BENT UP PLAQUET ENDS.)
400 „ For Centrally Drilled Lenses
(CLAMPS ATTACHED BY SHORT BRACKET.)
700 „ For Centrally Drilled Lenses
(SWAN NECK BRACKETS.)
800 „ Regular Pattern with Double Straps

SAMPLES and PRICES WILLINGLY ON APPLICATION.

The British Ocentric Optical Co., Ltd.,

Wholesale and Manufacturing Opticians,

12 & 13, EAGLE STREET, SOUTHAMPTON ROW,

LONDON, W.C. 1

Telegrams—Ocentricco, Westcent, London. *'Phone—Holborn 560*

Cables—Ocentricco, London.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

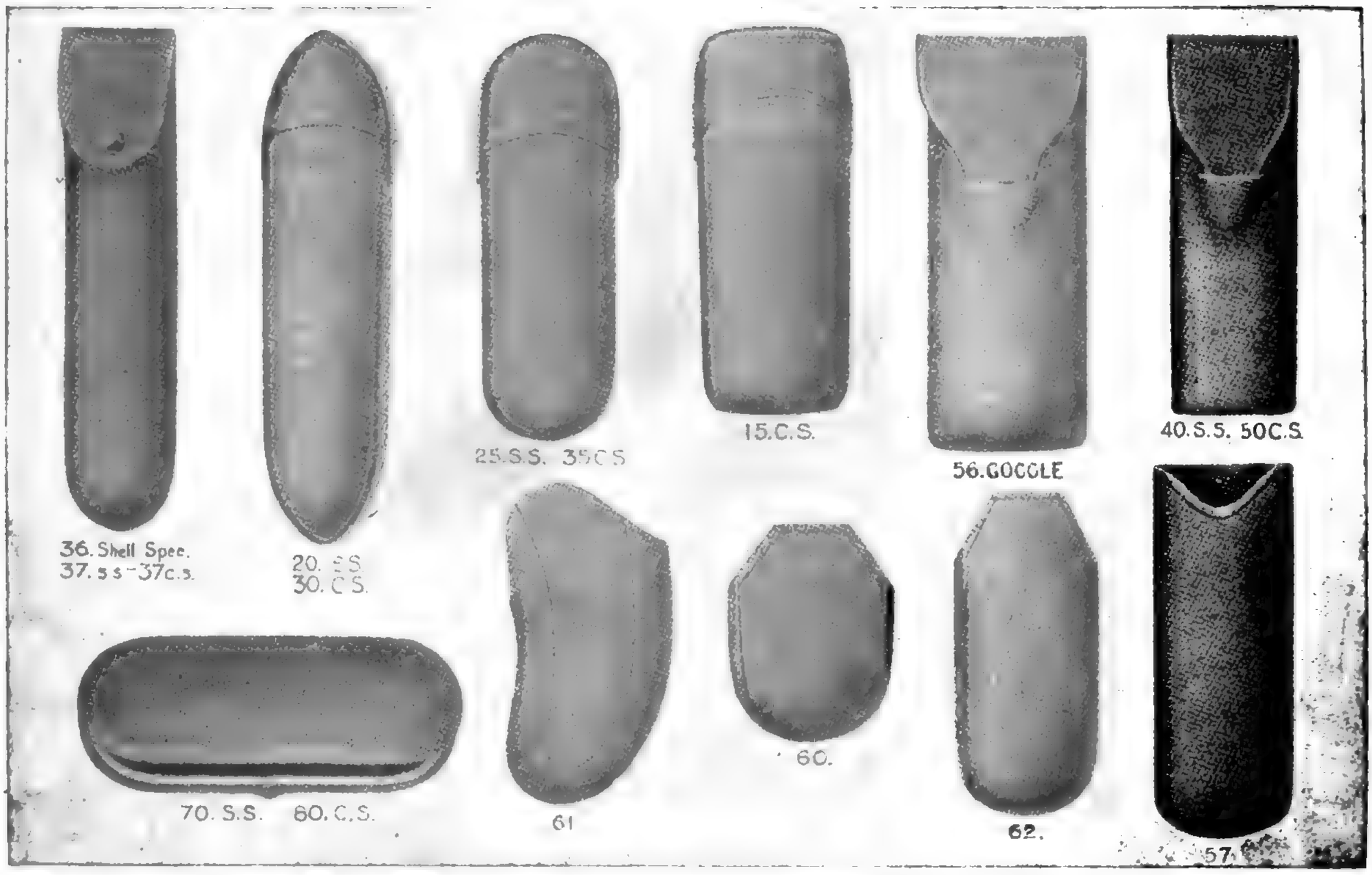
WHOLESALE TRADE ONLY.

W. Smythe & Co. Ltd.

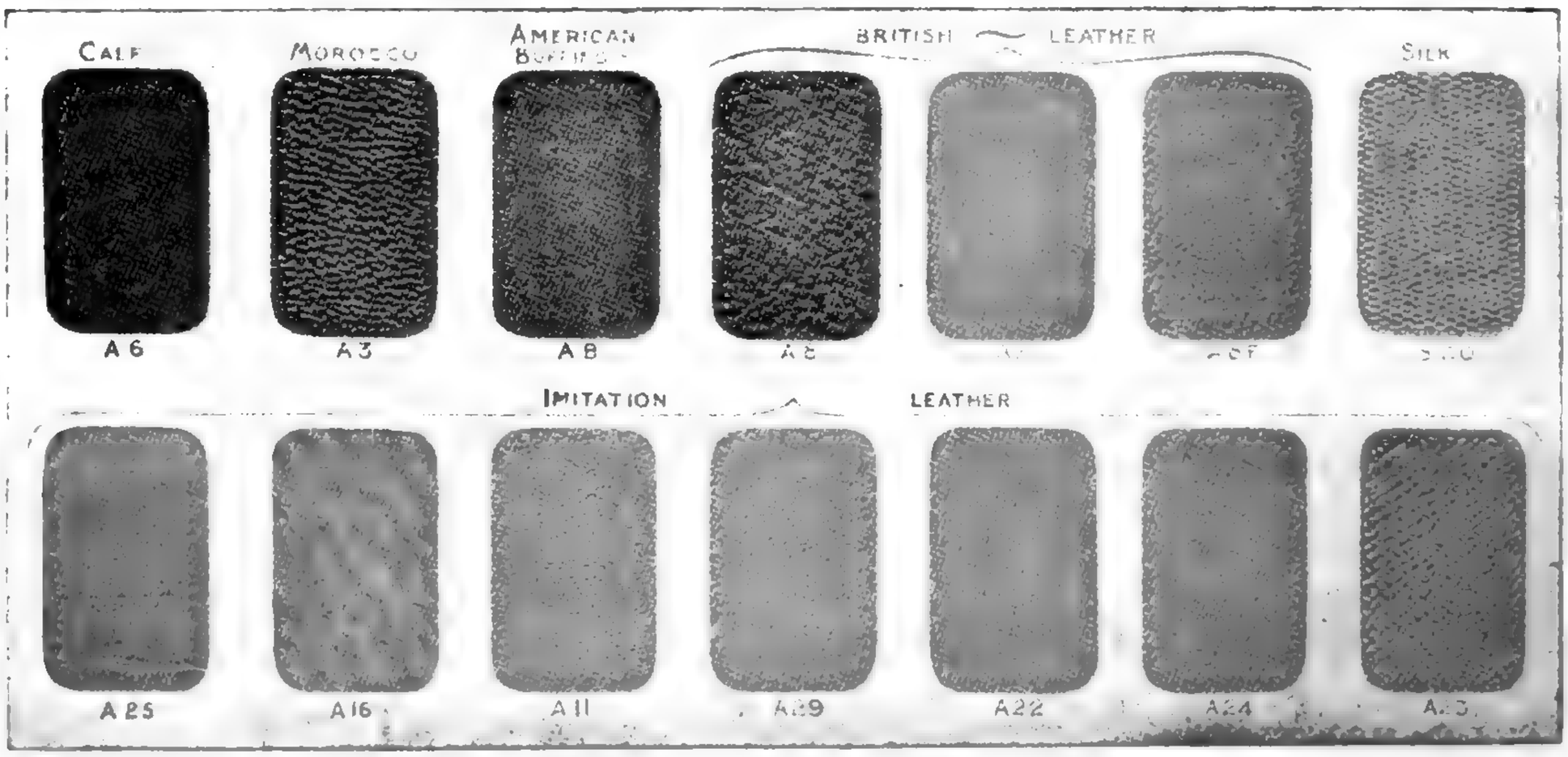
Head Office: 66 and 67, EDWARD ST PARADE, **Birmingham**

Branch Works—HOCKLEY AND WALSALL.

Patent Optical Case Manufacturers



ALL OUR GOODS CAN BE COVERED WITH THESE MATERIALS AND VELVET.



ILLUSTRATIONS HALF-SIZE. COMPETITIVE PRICES

Also Makers of Patent Spring Lid Cases "NOWATE" Write for List and Prices.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

What builds up your Rx turnover if not the character of your service and the quality of the eyeglasses you supply?

Your training and experience enable you correctly to diagnose eye-defects and prescribe properly adjusted glasses. This ability is naturally the corner-stone in the structure of your business.

But hardly less important is the accurate interpretation of your Prescriptions. Indeed, without full and absolute confidence in the firm handling this part of your work, your personal skill is likely to be nullified entirely.

Your can place complete trust in the L.O.C. Service.

As far as human foresight, technical skill, and mechanical facilities can ensure it, we have provided against every untoward emergency likely to impair our customers' interests.

Telephone: MUSEUM 4572

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris. France.

Also at—2, Str-Bursei, Bucharest, Roumania.

Telegrams: Locoptical Kincross London.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

only second-hand but various new pieces of apparatus are included, however; and among these we notice Professor Cheshire's squaring on eyepiece for correctly adjusting telescope objectives, a novel light-filter for colour photography, a 1in. plankton searcher for pond-life workers, a cheap rotatable clinical thermometer re-setting case; adjustable drawing board trestle, new spectroscopic ocular, lantern slides of line spectra and a new science lantern.

The Spy Glass.

A rival to the monocle (says the 'Daily Express') has arisen in the spy glass—a quaint revival from the picturesque eighteenth century days. The spy glass owes its newfound popularity to the same cause as the monocle—women who are averse to wearing their ordinary glasses when they are dressed for the dance and the theatre. The quaint little spy glass, slung on its gold chain and held by a dainty gold or tortoiseshell handle, is less formidable than the lorgnette, which suggests the dowager, or at least the grande-dame. The compromise of the spy glass has specially appealed to the younger generation of women, and is indeed so popular that the fashion is being adopted by some who do not require its aid.

New Companies.

Thomas Styring & Son, Ltd.—Private Company. Capital, £15,000 in £1 shares. To take over the business of lens workers in glass and pebble, and manufacturers of and dealers in glass and pebble lenses, carried on as Thos. Styring & Son, at Crystal Works, Penistone Road, Sheffield, and to adopt an agreement with J. B. Styring. The first directors are:—J. B. Styring, 267, Upperthorpe, Sheffield (chairman and managing director), C. P. Styring and E. L. Styring, 37, Parker's Road, Broomhill, Sheffield. J. B. Styring is permanent, subject to holding 5,000 ordinary shares. Qualification of directors: 500 shares. Registered Office: Crystal Works, 327, Penistone Road, Sheffield.

W. T. Storey, Ltd.—Private Company. Capital, £10,000 in £1 shares (8,000 preference and 2,000 ordinary). To take over the business of a jeweller and watchmaker, carried on by F. Diss at 244, Dalton Road, Barrow-in-Furness, as "W. T. Storey," and to carry on the same and the business of opticians, electroplaters, etc. The first directors are:—F. Diss, 239, Abbey Road, Barrow-in-Furness (permanent governing director, subject to holding 1,000 preference shares). H. C. Diss, 239, Abbey Road, Barrow-in-Furness. Secretary: H. C. Diss. Registered Office: 241, Dalton Road, Barrow-in-Furness.

Sunbeam Tours, Ltd.—Private Company. Capital, £2,000 in £1 shares. To acquire the interests of H. Cox in the Sunbeam Tours, including all patents, stock-in-trade, and trade marks, and to carry on the business of photographers, manufacturers of sunscopes, stereoscopes, and other optical instruments and lantern slides, etc. The first directors are: W. Richards "Shrublands," Hersham, Walton-on-Thames, G. H. Clarke, 2, Southgate, Sleaford, Lincs., H. Cox, 18, Clifton Road, Weston-super-Mare (managing director), all permanent, subject to holding 250, 250, and 750 shares respectively. Registered Office: 69-70, Fleetwood House, High Holborn, W.C.1.

Johnson & Slater, Ltd.—Private Company. Capital £1,000 in £1 shares. To adopt an agreement with W. O. Slater and S. J. Johnson, and to carry on the business of manufacturers and importers of and dealers in electrical goods and accessories, automatic time recorders, clocks, and all kinds of electrical, scientific, surgical, nautical, optical, magnetic, telegraphic, photographic, philosophical and mathematical instruments etc. The first directors are:—E. J. Johnson (permanent director and chairman), 33, Anfield Road, Liverpool, master mariner, and W. O. Slater, The Dunes, Hightown, Lancs., merchant. Registered Office: 119-121, The Albany, Oldhall Street, Liverpool.

F. Diss & Sons, Ltd.—Private Company. Captial £10,000 in £1 shares (8,000 preference and 2,000 ordinary). To take over the business of a jeweller and watchmaker carried on by F. Diss at 19, Market Place, Dewsbury, as "F. Diss & Sons," and to carry on the same and business of opticians, electroplaters, etc. The first directors are:—F. Diss, 239, Abbey Road, Barrow-in-Furness (permanent governing director, subject to holding £1,000 preference shares). F. S. Diss, 7, Blenheim Terrace, Oxford Road, Dewsbury (chairman). Secretary: F. S. Diss. Registered Office: 19, Market Place, Dewsbury.

Owing to cancellation of match between Westminster Wesleyan A.A. F.C. and Bondwell F.C., on Saturday, February 4th, a local Derby was arranged with the Hamblin F.C., but unfortunately the match had to be postponed owing to the inclement weather, and the bad state of the ground.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

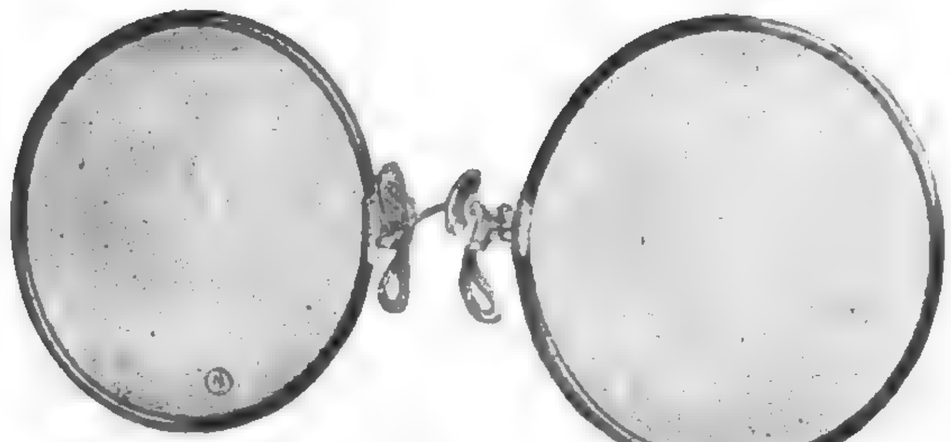
"Promises will win friends, but non-performance will turn them into enemies"

REALFIT FINGER PIECE MOUNTINGS AND FRAMES make friends and keep them because they surpass the promises we make for them. In performance they meet every requirement of the wearer.

Realfit Finger Pieces are the first word in beauty and the last word in comfort. Down to the minutest detail they personify the skill of expert craftsmen.

From A to Z—the Realfit is constructed with jeweler's precision. The metal is 1/10-12 ct. throughout. Made in all standard sizes with a complete assortment of guards. When you think of Finger Pieces—think of Realfit.

NEW JERSEY OPTICAL Co.
Newark, N.J. . . . . U.S.A



Digitized by Google

Original from THE OHIO STATE UNIVERSITY

DEPENDABILITY



One of the strongest reasons why far-seeing opticians have been specifying Shur-on gold filled spectacle frames is because of their downright dependability.

They have fully appreciated the fact that a thoroughly dependable frame was one of the surest ways of winning the confidence, future custom and goodwill of their patrons.

Since 1864—dependability along with "Quality Beyond Question" have been two of the cardinal principles upon which Shur-on frames have been built.

Be critical—say "SHUR-ON" to your wholesaler.

Shur-on Optical Co.,

Rochester, N.Y., U.S.A.

Shur-on Products

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"You Cannot TRADE S-Q MARK *Buy Better"*

STEVENS' QUALITY
Optical Goods

UNQUALIFIED approval meets this celebrated line wherever introduced.

WE are sole agents for the United Kingdom and can invariably supply your requirements from stock.

One Quality Only—The Best Made

1/10th 12ct. Gold Filled

Specialising in the Fingerpiece Mount

Send us your enquiries for
Spectacles and Eyeglasses—Frames and Mountings

Complete Catalogues on Application

H. WILLIAMSON Ltd.
Optical Section
87/89 GREAT SAFFRON HILL, LONDON, E.C.1

General Optical Supplies—Prescription and Repair Work—
Fittings and Instruments—Optical Machinery

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Elliott Optical Co.,

104 & 105 GT. SAFFRON HILL,

LONDON, E.C.1

TRADE MARK.

There is no Better House for

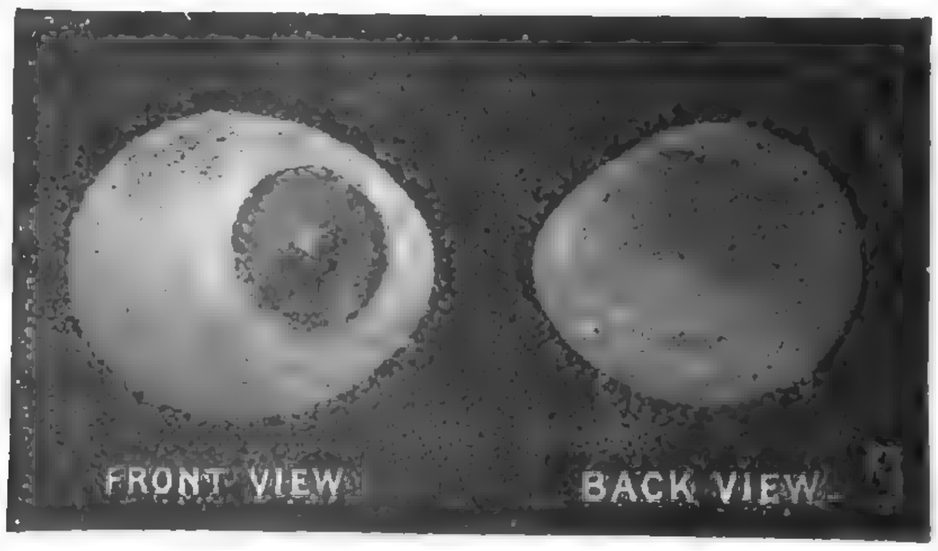
Rx Work.

RXS. RETURNED PROMPTLY,
ACCURATELY DISPENSED
and at REASONABLE PRICES.

Complete Outfit of Rx Stationery supplied,
Free of Charge,

SNELLEN'S IMPROVED ARTIFICIAL EYES

PACHE & SON, 75, Station St., Birmingham.



MAKERS TO THE PRINCIPAL HOSPITALS.
Selections sent to Surgeons. Also Makers of the ordinary Shell Eye.

The Optician's Handbook.

Price 4s. 0d. Post Free.

An elementary text book required by every student of Optics.

It is an introduction to "The Study of the Refraction of the Eye, its Anomalies and their Estimation and Correction by means of Glasses.

The Hatton Press, Ltd.,

125, Fleet Street, LONDON, E.C.4

BRITISH OPTICAL INSTITUTE, LTD.,

(College of Optics).

Complete Training for the Sight-Testing Optician.

Supplementary to the usual Daily Classes and Correspondence Courses, a series of Evening Classes is held, for those desirous of preparing themselves for any of the Optical Examinations.

A Course of Weekly Evening Lectures, and Demonstrations, for candidates for the F.B.O.A. Examination, and for post-graduates, has also been arranged.

Clinical Classes.

are held on two afternoons a week, and give Students the special advantage of meeting actual cases, generally of particular interest.

The whole work of the Institute is carried out under the supervision of the Principal, assisted by Mr. Geo. Colebrook, F.B.O.A., F.S.M.C., (Master's Prizeman).

For full particulars apply to:—The Principal, Dr. MAX COQUB, B.Sc., Fern Lodge, 20a, Grove Road, Brixton, S.W.9

Telephone: Brixton 677.

Worshipful Company of Spectaclemakers.

Tuition for the Company's Examinations in Optics and Sight Testing at

THE SCHOOL OF OPTICS Ltd.

2, GUILFORD PLACE, LONDON, W.C. 1

Particulars on application.

THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER

Subscription Form. **123-125, Fleet Street, London, E.C.4., England.**

Send a copy each week of THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER post free for which we enclose .....shillings for.....weeks.

UNITED KINGDOM 17s.
and ABROAD 20s.

Name.....

Business.....

Address.....

.....

A remittance of 17s. (or 20s. Abroad) for 52 issues includes "THE OPTICAL ALMANAC" post free.

Cheques made payable to The Hatton Press Ltd.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Stocq Solid Gold —

In transactions involving optical goods created from Solid Gold you should have more than merely a warrant of the materials.

You should have assurance that the makers are competent to design and produce articles that will reflect the dignity of the metal.

Years of experience have taught the optical trade that such assurance may safely be placed in the word Stocq

That trademark in the bridge of a Solid Gold frame or mounting is unqualified assurance of construction and finish worthy of a fine piece of jewelry

— Specify Stocq Solid Gold —

Manufactured by

THE STANDARD OPTICAL Co.,

GENEVA, N.Y., U.S.A.

Makers of High Grade Frames, Mountings, Lenses and Optical Machinery.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings is3d. per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

TRIAL CASE Wanted, good condition. Box 3528, c/o "The Optician," 125, Fleet Street, E.C.4.

FULL SIZE Trial Case, four trial frames, lenses, etc. Seen after 7. Bernard Moss, 141, Dartmouth Road, London, N.W.2.

FOR SALE. Half-plate stand camera, mahogany, 10" ext. Beck-Steinheil Unofocal Ser. 1., No. 5. f/6 with Beck Celverex shutter, T.B. to 1/80 sec., 3 mahogany double dark slides, stand, focusing cloth, waterproof case, the whole £3 10s. Also ¼-plate Holborn reflex, magazine 12, Ilex, R.R. f/77. T. and I to 1/100 sec. Leather case, £2. Please address, Box 3508, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone, 2248 Avenue.

Partnerships and Businesses.

WANTED to purchase, sight-testing business showing fair profits, up to £500. Harper, Optician, Smethwick.

WANTED, sight-testing optical business about April or May. London or suburbs. Box 3527, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED to purchase immediately, sight-testing business, Midlands or South Yorkshire. Edgar, 133, St. George's Road, Bolton.

OPTICIAN'S Business, large Lancs. town, for immediate disposal. Suit young energetic man with small capital. Box 3525, c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 8*

F.S.M.C., age 26, relinquishing own business, seeks position April. Capable refractionist, fitter and repairer. Box 5861, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST CLASS rimless fitter seeks situation, edging and bifocal worker, age 21. Wholesale and retail experience. London or suburbs preferred. Box 5860, c/o "The Optician," 125, Fleet Street, E.C.4.

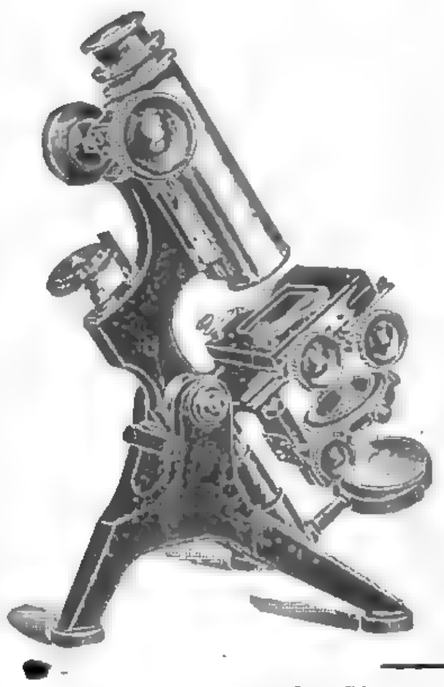
FIRST-CLASS Surfacer requires situation, anywhere in England. 7 years' experience of best work. F. C. Taylor, 68, Trehurst Street, Clapton, E.5.

WANTED by West End Opticians, first-class assistant; good opening for energetic man. Apply by letter, Hamblin, 5, Wigmore Street, W.1.

YOUNG LADY seeks position with retail optician. Several years' West End experience in all shop and prescription work. Conscientious worker. Reply, Box 5862, c/o "The Optician," 125, Fleet Street, E.C.4.

SELL WATSONS' BRITISH-MADE MICROSCOPES

NOW READY



New Catalogues:

Part 1—Students' Microscopes.

Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,
313, High Holborn, W.C. 1
Works: High Barnet, Herts. Established 1837.

VISUAL OPTICS & SIGHT-TESTING
By LIONEL LAURANCE.
A New Edition, just out. Price 21s. 21s. 9d. post free.

GENERAL AND PRACTICAL OPTICS
By LIONEL LAURANCE.
A New Edition. Price 21s. 21s. 9d. post free.
The two ideal books for the acquirement of a knowledge of the subjects indicated by their titles.
THE HATTON PRESS, Ltd.,
125, Fleet Street, London, E.C.4

LENS GRINDING FACTORY
FOR SALE
as a going concern by order of Receiver.
KINGSTON-ON-THAMES.
Ground floor premises comprising 4 offices and workshops about 4,000 ft. with open yard, etc.
There are roughing, smoothing, moulding, polishing shops, beside testing store rooms and the whole of the premises are fitted with up-to-date lens grinding machinery and stores.
The premises are held for a term of about 18 years at a Ground Rent of £98 per annum.
PRICE for LEASE & PLANT with VACANT POSSESSION **£2,000** or offer.
Particulars may be had of Messrs. Lord, Fisher & Co., Accountants, 37, Walbrook, E.C.4 or of the Auctioneers, Messrs. Chamberlain & Willows, 345, Goswell Road, E.C.1 City 9019.

A New Optical Publication.

"PRESCRIPTION PITFALLS and How to Avoid Them,"
By HENRY C. RAXWORTHY
("Obfuscando")
ONE SHILLING AND SIXPENCE.
No Retailer or Wholesaler should be without a copy. An entirely original work.
Published by The HATTON PRESS, Ltd., and obtainable of all wholesalers.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

MANY SUCCESSES IN THE EXAMINATIONS!
Your Opportunity to
QUALIFY IN OPTICS
PRACTICAL WORK. Students taking the Course may receive personal tuition in the practical work AT ANY TIME DURING THE COURSE.
Expert Tuition by Correspondence for the SIGHT-TESTING DIPLOMAS of the Worshipful Company of Spectacle Makers (F.S.M.C.), or the British Optical Association (D.B.O.A.).
Write for full particulars—
C. A. SCURR, M.P.S., F.S.M.C., F.I.O., etc.
64, High Street - - - - BARNET.

Canadian FUSED BIFOCAL LENSES in either finished, semi-finished or rough are the FINEST MADE barring none, and they can be had for very MUCH LESS. It will pay you to send for our prices and samples.

STERLING ACCEPTED AT PAR.

COMMERCIAL OPTICAL Co.,
DANDURAND BLDG., MONTREAL.
Cable "Optical" A.B.C. Code 5th. Edition.

D.B.O.A. and F.S.M.C.
Tuition by post under Expert Tutors. Courses for Diploma Examinations. Short period classes before each examination are given at Manchester. Residence provided.
Apply for particulars to Secretary.
PENNINGTONS, University Tutors, 254, Oxford Road, Manchester

PERCY S. DE SAULLES.
Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES.
Micro Cover Glasses, Glass Cells and Cavity Slips, etc.
The Platts, Amblecote, Stourbridge.

C. BAKER 244 HIGH HOLBORN LONDON
Estab. 1765
YOUR REQUIREMENTS however exacting, will probably be met from our Second-hand Stock
WRITE TO-DAY FOR LIST, POST FREE.



OPTICAL BLOCKS
To illustrate all features of Optical Service. Write for Lists.
Chemists' Design Service,
12, Humberstone Gate, Leicester

CONFESSIONS
From confessions made we have discovered that in many cases, when a man sends to us for the first time, he does so in a dubious spirit—and we can understand it.
■ ■ ■
Words are one thing, deeds are another. We have all had our disillusionments and it is not always possible to accept a statement simply because it appears in print.
■ ■ ■
We claim that there is no quality better than W.O.W. and to give a quick and reliable Rx service at prices which save you money.
■ ■ ■
A bold assertion!!—but more and more Opticians are finding the truth in it and we are repeatedly having the pleasure of proving our case to men who doubted (rightly so) at first.
■ ■ ■
Our case. That it is possible to pay less and yet obtain the very best of quality and service. Think about it.
WILLESDEN OPTICAL WORKS, LTD.
LENS FACTORY:
DUDDEN HILL LANE, N.W.10

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
C. H. DYMOND, M.I.Mech.E., F.I.C.P.A
W. P. THOMPSON & Co.,
12, CHURCH STREET, LIVERPOOL.
Chartered Patent Agents.
H. E. POTTS, M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG, M.T.I., F.I.C.P.A.

T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and ABRONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
ESTABLISHED 1878 TELEPHONE CITY 419

The Optical Society.
President: Mr. R. S. WHIPPLE, M.I.E.E.
Vice-Presidents: Prof. FREDERIC J. CHESHIRE, C.B.E., Director of the Technical Optics Department of the Imperial College of Science and Technology, South Kensington; Sir HERBERT JACKSON, K.B.E., F.R.S.
Hon. Treasurer: Mr. I. G. AITCHISON, B.A., LL.D.
Hon. Secs.: Mr. L. C. MARTIN, B. Sc., Imperial College of Science and Technology, South Kensington S.W.7 and
Papers' Secretary: Mr. F. F. BRYSON, M.A., B.Sc.

SPECTACLES & EYEGLASSES.
Their Forms, Mounting and Proper Adjustment
by R. J. PHILLIPS, M.D.
Fourth edition revised with 56 illustrations.
Price 6s. 6d. Post Free 7s.
THE HATTON PRESS, Ltd., 125, Fleet Street, London, E.C.4

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

***A.*—Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

POSITION required in any capacity by young man, 27, who wishes to learn the business. London or suburbs. Box 5869, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., D.B.O.A., 22, wants position as first assistant or manager, in a good class business. Box 5879, c/o "The Optician," 125, Fleet Street, E.C.4.

GLAZIER (male expert) rimless and bevel, desires situation, done little cutting, drilling and fitting. 7, Clarendon Road, West Green, N.15.

OPTICIAN desires situation as first assistant, tall, age 24, F.S.M.C. Has good knowledge of photography and all optical instruments. Apply, Box 5863, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT (21) requires situation, wholesale or retail, used to fitting, drilling, edging and repairs. C., 66, Kingswood Road, Fulham, S.W.6.

SURFACER, First-class worker wanted to take sole charge of small plant in suburbs. Apply, by letter in first instance, giving fullest particulars as to experience, age, salary, etc. Aves, Rider and Partners, Opticians, 115, Hoe Street, Walthamstow.

YOUNG MAN (25) manufacturing experience in optics, seeks post in sales department. Good references. Write, T.D., 251, East India Dock Road, E.14.

RELIABLE Man desires engagement as traveller, stockkeeper, or any position in the optical trade, 20 years' experience, excellent references. Box 5868, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT Wanted, take charge small branch, workshop knowledge, soldering, etc. Sight-testing preferred, not essential. State salary, references, first letter. Box 5871, c/o "The Optician," 125, Fleet Street, E.C.4.

RIMLESS Fitter and glazier required, male or female. Apply, stating wage to C. J. Phillips, 36, London Road, Portsmouth.

COMPETENT Skilful Refractionist (33) with extensive managerial experience desires appointment. Experienced in prescripton work and possessing sound practical knowledge of refraction gained from busy practice. Box 5867, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. (24), desires position with sight-testing optician in Manchester or district, 6 years' practical experience and first-class references. Box 5866, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, young, keen, capable and adaptable, is in need of position. Well educated. Has good knowledge of sight-testing. Box 5865, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION sought by capable qualified refractionist. Good credentials. High-class experience. F.S.M.C., 4, Chesterfield Road, Bristol.

MECHANIC ~~requires~~ situation, 22 years' experience, 14 years in optical machine shop, lens tools, press tools, turning, fitting, etc. W. Tucker, 766, Holloway Road, Upper Holloway, N.19.

F.S.M.C. (nine years qualified) London experience, highest credentials, requires post with view to partnership in well established business, in or near London. Box 5872, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, 21, passed first part S.M.C. Refractionist, well up in all repairs, edging, cutting, rimless mounting. Highly recommended by present employer. Box 5864, c/o "The Optician," 125, Fleet Street, E.C.4.

SMART YOUNG MAN (22) seeks situation. Warehouse or lens department. Thorough general knowledge. Box 5859, c/o "The Optician," 125, Fleet Street, E.C.4.

GLAZIER, male, edging and rimless fitting, piece-work if desired or rimless fitting at home. L.R., 6, Fairfield South, Kingston-on-Thames.

QUALIFIED Assistant seeks re-engagement, served practical apprenticeship A to Z in workshops, last 2 years' sight-testing, good salesman, torics and kryptoks. F.S.M.C., c/o Ebbage & Son, Consulting Opticians, Kingston-on-Thames.

GOOD All-round gold frame maker and jobber, first-class references, could take charge. Box 5840, c/o "The Optician," 125, Fleet Street, E.C.4.

TORTOISESHELL Worker wants work, good filer, joint and finisher. Box 5853 c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION wanted by capable organiser with wide experience in all departments of wholesale ophthalmic trade. Has also considerable retail experience in handling general optical, photographic and nautical goods. Expert refractionist, fitter and salesman. Highest references. Box 5855, c/o "The Optician," 125, Fleet Street, E.C.4.

POSITION as sight-testing optician. Highest efficiency in use of ophthalmoscope and retinoscope. Could take charge of workshop or work in same. Sitting for examination in June. References, first-class. London or South of England preferred, or abroad. Box 5852, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN (21), 5 years' experience with dispensing optician. Good salesman, seeks engagement. Reply, Postlethwaite, Earle Road, Edge Hill, Liverpool.

CAPABLE Rimless driller and fitter, 7 years' experience, good knowledge of workshop, excellent references. London preferred. Box 5851, c/o "The Optician," 125, Fleet Street, E.C.4.

TEMPORARY Engagements, sickness or holidays, F.S.M.C., D.B.O.A., Locum, 59, Eden Street, Kingston-on-Thames.

D.B.O.A. Young Lady, experienced, desires position with good class firm of sight-testing opticians. Box 5850, c/o "The Optician," 125, Fleet Street, E.C.4.

CAPABLE Manager or first assistant requires position, good refractionist, 14 years' experience, able to take full charge of workshop, excellent credentials. Apply, Box 5849, c/o "The Optician," 125, Fleet Street, E.C.4.

MECHANIC used to meterological and general instrument work, hand-turning bench, finishing and lacquering. 18 years' experience, any distance, town or country. F. Orford, 83, Ashmore Road, Paddington, W.9.

APPRENTICESHIP required for a well educated youth, with well established provincial optician, to live in. 118, Wellington Road, South Hounslow.

SURFACING Charge Hand seeks situation, used to first class work only, 20 years' experience, distance no object. Box 5838, c/o "The Optician," 125, Fleet Street, E.C.4.

CAPABLE Man wanted for sight-testing, must be good salesman, and reliable watch jobber, permanency to good all-round man. State age, wage required, experience and particulars to Box 5848, c/o "The Optician," 125, Fleet Street, 125, Fleet Street, E.C.4.

COMPETENT Refractionist (O. & S.) and keen salesman, 9 years' experience, requires post in London as manager or first assistant. Box 5858, c/o "The Optician," 125, Fleet Street, E.C.4.

OPTICAL Engineering. Associate Royal College of Science seeks engagement with a manufacturing firm. Age 27. Physicist and mathematician. Box 5846, c/o "The Optician," 125, Fleet Street, E.C.4.

Concluded on page 6.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

THE

MYDDELTON



TORTOISESHELL SPECTACLES.

In Selected Solid Tortoiseshell,

Dark, Light-Mottled, & Amber, with 9ct. gold joints only.

The vogue of tortoiseshell spectacles is due to the re-discovery of their elegance and comfort; **MYDDELTONS** are a further re-discovery of an old form. They are made in a particular style which ensures an easy "cling," keeps them comfortably in position and enables them to be assumed and removed with the utmost ease, and they are supplied in a compact snap case, size of illustration. **MYDDELTONS** have been thoroughly tested and have "made good," and increased output now enables us to invite a larger number of opticians to avail themselves of an article of real distinction.

SOLE MANUFACTURERS:—

R. ARCHER & SONS, Ltd.,

1, AMWELL STREET, LONDON, E.C.1

Digitized by Google

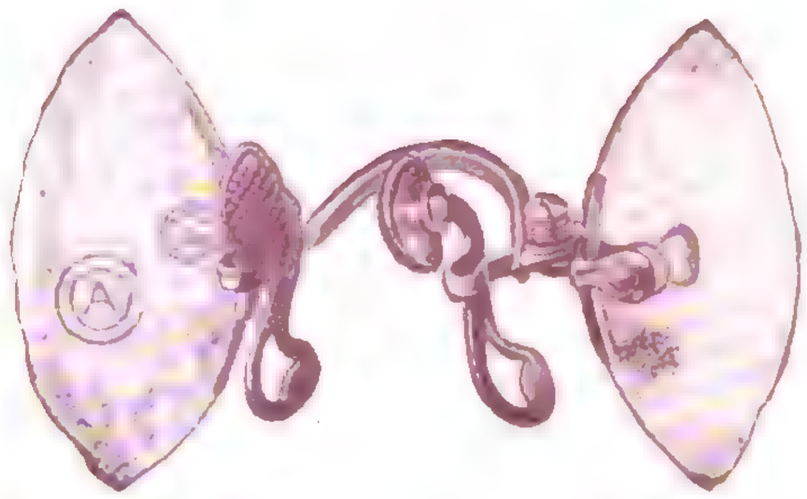
Original from THE OHIO STATE UNIVERSITY

ERICAN·OPTICAL·COMPANY, LIMITED

WELLSWORTH

FINGERPIECE EYEGLASS MOUNTINGS and FRAMES.

Coil Spring and Washer Construction.



The American Optical Company can manufacture and supply you with any grade of Fingerpiece Eyeglass to meet any requirement or any market from the highly skilled Bilt-In Bearing construction which is

THE FITS-U

to the ordinary coil spring washer construction which is supplied in high grade quality and also lower grade of gold-filled stock.

Consult your Wholesale House.

WELLSWORTH

TRADE (A) MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C.4. (Printed by The Century Press, Fulham), Feb. 10, 1922.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The OPTICIAN And SCIENTIFIC INSTRUMENT-MAKER

NEW SERIES — INCORPORATING "THE BRITISH OPTICAL JOURNAL"

Vol. LXII. No. 1612 FRIDAY, FEB. 17, 1922.

ROSS BINOCULARS.



British Government Tests have proved these to be the finest Binoculars in the world.

Send for our new catalogues and terms.

ROSS Ltd., Clapham Common, LONDON, S.W. 4

ELLIOTT'S Rx SERVICE

leaves nothing to be desired.

ACCURACY—PROMPTNESS and REASONABLE PRICES.

104/5, GT. SAFFRON HILL, E.C. 1



ZYLOVRIM

R. ARCHER & SONS, Ltd.,
1, Amwell Street, London, E.C.1

Reg'd at the G.P.O. as a newspaper PRICE 4d Subscription post free 12 months 17s
Postage in United Kingdom 1d

Digitized by Google Original from THE OHIO STATE UNIVERSITY

AMERICAN·OPTICAL·COMPANY.LIMITED

WELLSWORTH GOLD-FILLED.



There are probably as many kinds of GOLD-FILLED goods as there are different styles of lenses, and the values vary from better-than-excellent to worse-than-poor. There are so many opportunities to go wrong in the delicate operation of making GOLD-FILLED stock, and the way is so fraught with hazards, it is reasonable to believe that very much of the material started RIGHT ends WRONG.



But the many years experience of the American Optical Company in making their own GOLD-FILLED material is a guarantee against such risks. You therefore are safe in pinning your faith to goods made from Wellsworth GOLD-FILLED.

Supplied in various qualities for all kinds of Spectacle Frames, Eyeglass Frames and Rimless Mountings.

Apply to your Wholesaler.

WELLSWORTH

TRADE Ⓐ MARK (Regd).

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

GEORGE CULVER LTD.

Manufacturing Opticians

JOBBING AND PRESCRIPTION WORK

ACCURACY, NEATNESS,

PROMPTNESS

Large and full stocks of English made Frames and Lenses of all combinations.

ORDERS CAN BE EXECUTED PROMPTLY.

WHITE LION STREET
PENTONVILLE
LONDON. N.1.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

J.&R.F. LTD

You CAN increase your Toric Sales.

Our Toric Demonstrator will help you, and our Prescription Service on this class of work is efficient and prompt.

Get a DEMONSTRATOR now and try.

J. & R. FLEMING LTD.,

136-148 Clerkenwell Road, LONDON, E.C. 1.

Telephone:
HOLBORN {814 / 815
HOLBORN {2788 / 2789} Prescription Dept.

Telegrams:
"OTTICO." LONDON.

Branches with Prescription equipment:

J. & R. FLEMING (Brgm.), Ltd.
6, Key Hill Drive,
BIRMINGHAM.
Phone: Central 2569
Telegrams: "Brahma."

13a, CUSTOM HOUSE ST.,
CARDIFF.
Phone: Cardiff 743
Telegrams: "Ottico."

5, CROSS STREET,
NEWCASTLE-ON-TYNE.
Phone: CENTRAL 1085.
Telegrams: "Ottico."

8, SHUDEHILL,
MANCHESTER.
Phone: Central 7711
Telegrams: "Ottico."

J.&R.F. LTD

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Worshipful Company of Spectaclemakers.

INCORPORATED 1629

Master:
The Rt. Hon. VISCOUNT HILL, L.C.C.

Upper Warden:
CHARLES E. SEBAG-MONTEFIORE, Esq.

Renter Warden:
HARRY HYLTON-FOSTER, Esq., Past Master.

Director of Examinations:
The Rt. Hon. Sir WILLIAM HART-DYKE, Bt., M.A., Past Master.

All Letters, Communications and Payments should be made to the

Clerk of the Company and Secretary to the Certification Scheme.

14, Temple House, Temple Avenue, London, E.C.4.

Official Instructor:
Mr. LIONEL LAURANCE.

Director of THE SCHOOL OF OPTICS, Ltd., 2, GUILFORD PLACE, W.C.1.

The NEXT EXAMINATIONS

of the Company will be held at St. Bride's Institute, Ludgate Circus, E.C., in May, 1922.

MEMBERSHIP—The diploma holders of the Guild number over a thousand.

N.B.—*All Letters, Communications & Payments should be made to the* ACTING CLERK *of the Company, who is alone authorised to receive them*

The OPTICIAN And SCIENTIFIC INSTRUMENT MAKER

THE OPTICAL ENGINEER AND JOURNAL OF OPTOMETRY

31st Year Vol. LXII. No. 1,612

Subscription, Home, 17s. yearly; Abroad, 20s. including the "Optical Almanac" post free.

EDITED BY CHAS. HYATT-WOOLF, F.R.P.S., F.R.S.L.

Publishing and Editorial Offices

123-5, Fleet Street, London, E.C.4. Tel. CITY 5616.

LONDON, FRIDAY, FEB. 17, 1922.

Safeguarding of Industries Act.—The opponents of such protection as is afforded to British manufacturers under the Key Industries Act are still active in Parliament, but happily without receiving much encouragement for the achievement of their objects. On Tuesday evening last, Capt. Wedgwood Benn moved to introduce a Bill repealing the Safeguarding of Industries Act, 1921. He said that so far as evidence was available, the Act had done little good and much harm. After a number of other vague and very unconvincing generalities had been adduced, Sir R. Cooper spoke in opposition, and said that the Act, at any rate in its principal parts, was merely the carrying out of a purely Liberal Free Trade conviction. The Act must keep production in this country, and provide a large measure of employment. Moreover, it would be very unfair and very costly to try to upset the working of the Act until it had had a fair chance of getting into operation—which it had not yet had. On a division, leave to introduce the Bill was refused by 170 votes to 92.

* * *

To Employers.—We have just received, and not for the first time, a rather bitter complaint as to firms advertising for employees under box number, failing to return promptly testimonials or copies of testimonials, photographs, etc. Our correspondent who recites his troubles points out that it is rather hard on a man who is out of work to have to wait 14 or 20 days for the return of such documents, before he can make application for another

Digitized by Google Original from THE OHIO STATE UNIVERSITY

place—and that notwithstanding that he sent a stamped self-addressed envelope for their return. We think it only necessary to draw attention to this grievance, which will appeal to employers using our advertising columns to avoid inflicting unnecessary hardship upon applicants for employment.

* * *

Qualification in Optics.—Occasionally we are asked to publish letters that convey some expression of feeling on the part of uncertificated opticians with regard to the claim that a diploma gained by examination in general optical science and visual refraction is to be accepted as the evidence of "qualification" in sight-testing. This is unquestionably a good claim, so far as it goes. There is no other way, except by personal recommendation from a medical man, or someone else supposed to be in a position to know, whereby members of the general public can be convinced that they are putting themselves in the hands of a reliable consultant on the mechanical defects of sight. A good reputation for technical ability is earned, and its commercial rewards are enjoyed, by many sight-testing opticians who have no sort of qualification gained in the examination room and attested by a diploma. That is perhaps a consequence of the somewhat slow, though steadily increasing, distribution of diplomas gained by a genuine examination in the science and art of spectacle-fitting. Years ago technically valueless diplomas, acquired by purchase often from American colleges, were much more in evidence than they are now; and not only medical but other educated people were quick to seize on this abuse and turn it to the discredit of opticians as a class. The fake or quack diplomas have in years gone by done injury out of proportion to the numbers in which they were displayed, to the professional standing of opticians. By interested parties, the genuine optical diplomas (not being documents with legal force) have been "tarred with the same brush" as colourable imitations. And some old-established firms, ignoring the certification movement, have yet very successfully traded on their own reputation.

* * *

In spite of all this, wonderful progress has been made in popularising the optical diploma. Continual reasoned advertising, appealing consistently to the intelligence of the public and the trade, has brought about a change of view that is very marked, and is proved a valuable commercial asset. The tributes paid by leading scientific men to the work of opticians qualified by examination have been an important factor; as also the collective advertising of certificated opticians—a direction in which the Spectaclemakers Company in especial has done yeoman's work for its certificated members. Naturally the present position of the diploma holder in public estimation is a little vexing to the many sight-testing opticians who for one reason or another are "unqualified" in this way. Human nature being what it is, one cannot be surprised at protests against the indiscriminate application of the term "unqualified" where "undiplomaed" or "uncertificated" would do as well, and be actually truer. For there is no gainsaying the fact that a good many opticians exist, quite well qualified to test sight, who have never passed an optical examination. Our correspondent this week remarks that such can be found among the members of the Optical Society; and he might have added there are others who are members of no scientific society whatever. Any man who has a sound theoretical knowledge of visual optics is in a sense qualified to test sight. But of course there is another sense in which he cannot be well qualified for professional practice unless he has first gained experience—preferably by working with an experienced refractionist—in some one or other of the most convenient systems of sight-testing routine. Persons needing spectacles want sight-tests that are not only accurate but expeditious. So we can quite understand the possibility of a diploma holder seeking professional and commercial "instruction."

Grinding and Polishing Powders.

At a Joint Meeting of the Faraday Society and the Oil and Colour Chemists' Association, to be held on Thursday, March 9th, at 8 p.m., in the rooms of the Chemical Society, Burlington House, W.1., a group of papers will be presented dealing with the properties of powders considered from various aspects. Prof. T. Martin Lowry, F.R.S., and Mr. L. C. McHatton will deal with the grading of powders by elutriation. Prof. P. G. H. Boswell will contribute a paper on elutriation from the point of view of the geologist; and Dr. J. W. French will speak on grinding and polishing powders. Dr. R. S. Morrell, Mr. C. A. Klein and Mr. W. J. Palmer will discuss the subject from the point of view of the oil and colour chemists, and Mr. R. W. Whymper will deal with certain applications. The subject will then be thrown open for general discussion.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

On the Best Form of Spectacle Lenses—XXII.*

By A. WHITWELL, M.A., Fellow of the Optical Society.

Binocular Vision and the Field of View.

In the last two articles I treated this subject by the methods of trigonometrical computation or ray tracing and by Co-ordinate Geometry. In what follows I propose to use ordinary geometrical drawing or descriptive geometry. The methods of Descriptive Geometry are particularly applicable to Geometrical Optics and they do not appear to be used to the extent which, in my opinion, they deserve. It is true the methods of Descriptive Geometry are not so powerful as those of Analytical Geometry, but by their use many interesting results may be obtained very quickly and without any knowledge of mathematics. The method, as its name implies, is one which enables us to describe by means of actually drawn lines and curves instead of by words or symbols what takes place when rays of light pass through an optical system. The results obtained are qualitative rather than quantitative and illustrate the variation of quantities rather than express their numerical values. At the same time a fair idea of actual values of quantities may be obtained, within the limits of accuracy of drawing, when a sufficiently large scale is employed. More than once, when drawing accurately, I have stumbled across important results which I have subsequently verified by Co-ordinate Geometry and which I should not have thought of looking for had it not been for the drawing.

I propose then, in what follows, to investigate, or to speak more accurately, to illustrate particular examples of what happens when spectacle lenses are "angled," that is to say, arranged so that the optic axes are not parallel. Just as in the last article I propose to assume that

(1) The locus of the intersections of incident and emergent rays is a plane, called the intersection plane, at right angles to the axis of the lens.

(2) Each lens is corrected for spherical aberration for the centre of rotation of the eye.

I have drawn six figures in which

Fig. 1 shows lenses centred and angled outwards.

Fig. 2 shows lenses centred and angled inwards.

Fig. 3 shows lenses decentred outwards and angled outwards.

Fig. 4 shows lenses decentred outwards and angled inwards.

Fig. 5 shows lenses decentred inwards and angled outwards.

Fig. 6 shows lenses decentred inwards and angled inwards.

Referring to fig. 1, the object is supposed to be a plane at right angles to the median

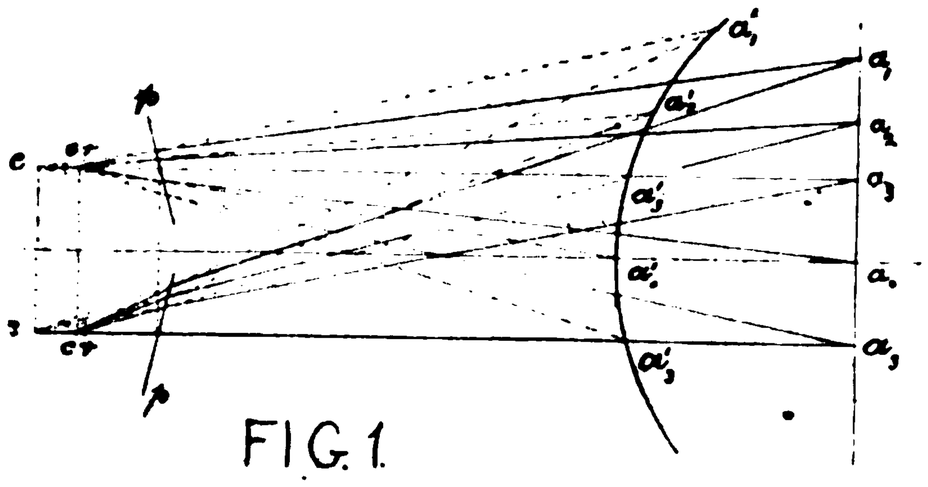


FIG. 1.

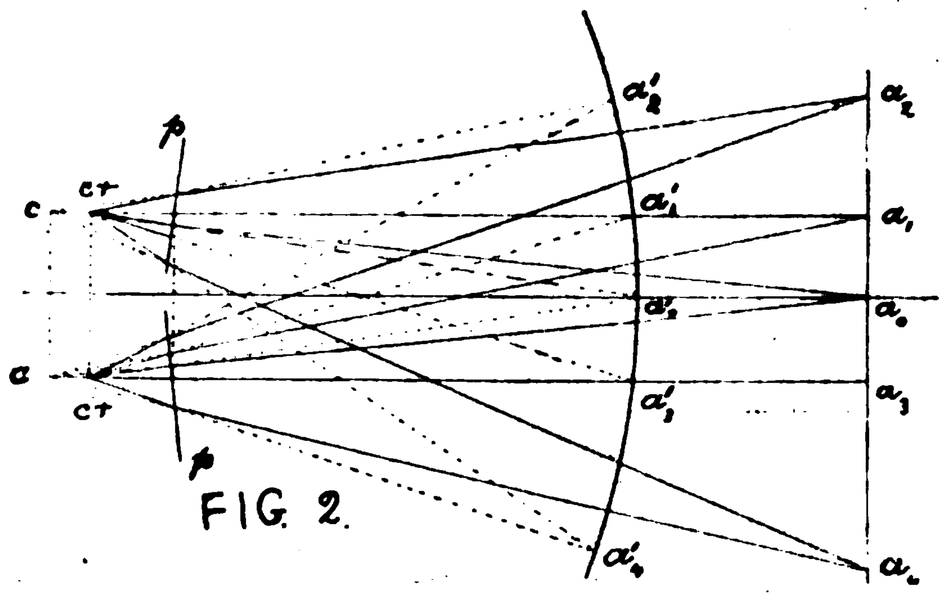


FIG. 2.

line and containing the points, a_0, a_1, a_2, a_3. The intersection planes p are angled outwards. The centres of rotation are marked cr and their conjugate points with respect to the lenses are marked c. Rays are drawn from

*The other articles in this series were published in THE OPTICIAN on the following dates, May 2, July 25, 1913; Jan. 9, Jan. 23, Feb. 6, Feb. 20, April 3, April 10, May 29, July 3, Aug. 21, Sept. 4, Oct. 30, 1914; Dec. 15, 1916; Aug. 29, Oct. 3, Oct. 31, 1919; Jan. 9, Nov. 19, 1920; June 17, Nov. 25, 1921; Jan. 13, 1922.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

each point a_1, etc., of the object to the conjugate points c, pairs of rays are drawn from the centres of rotation through the intersection points of the incident rays with the intersection planes; the intersection of pairs of emergent rays are marked a'_0, a'_1, a'_2, etc. The curve joining these points is the image corresponding to the object line a_1, a_2, etc, or it may be regarded as the trace on the paper of the image surface corresponding to the

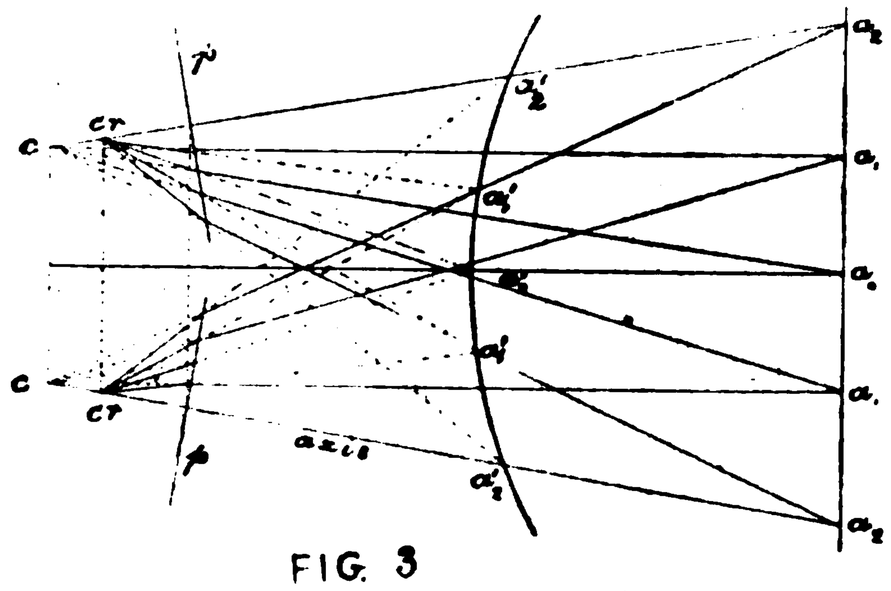


FIG. 3

object plane of which the line a_1, a_2, etc., is the trace.

The effect of outwardly angling properly centred lenses is to bring the image nearer to the eyes and to make a plane object appear to be convex.

Fig. 2, in which the lenses are angled inwards, everything else being the same as in fig. 1, shows that inward angling of the lenses makes the field appear concave. In both cases the image is nearer the eyes than the object. It is a fair deduction to say that some arrangement of intersection planes or

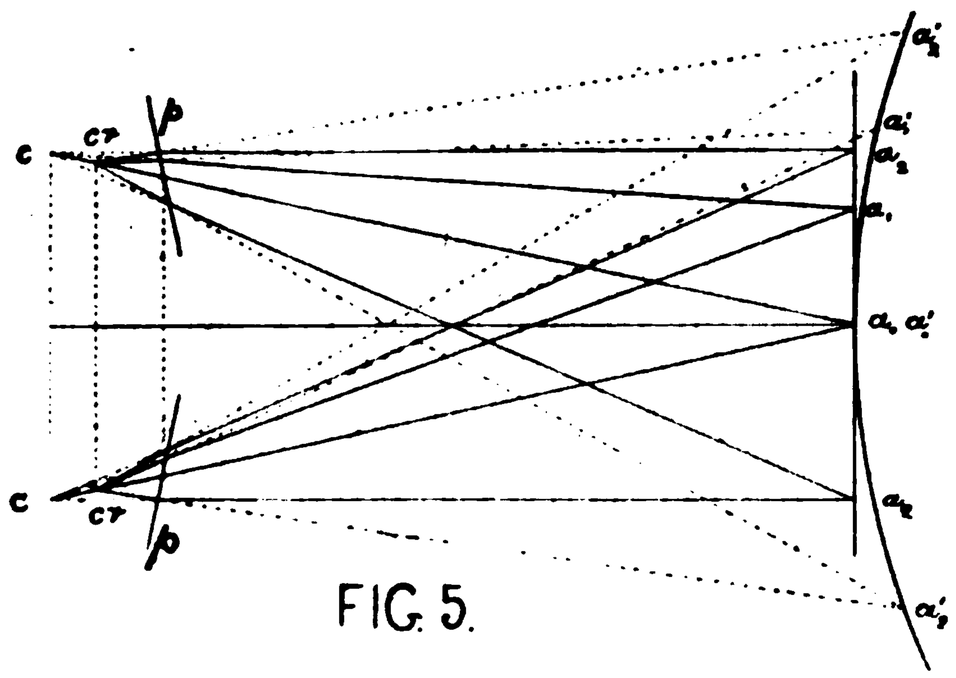


FIG. 5.

lenses betwen those shown in figs. 1 and 2 would produce a plane image. The analysis in the last article shows that this deduction is correct since properly centred lenses having their intersection planes normal to the axes are shown to produce plane images of plane objects.

Referring to fig. 3 it will be seen that the lenses or intersection planes are angled outwards, and the axes of the lenses will intersect in the median line in some point away to the left. The lines joining the centres of rotation cr, and their conjugate points c pass through the centre of the lenses. The centres of rotation are nearer together than the centres of the lenses and further apart than their conjugate points c. I have called the distance between the centres of rotation $2e$ and the distance between the points c, $2k$. The object plane is marked a_0, a_1, a_2, and the

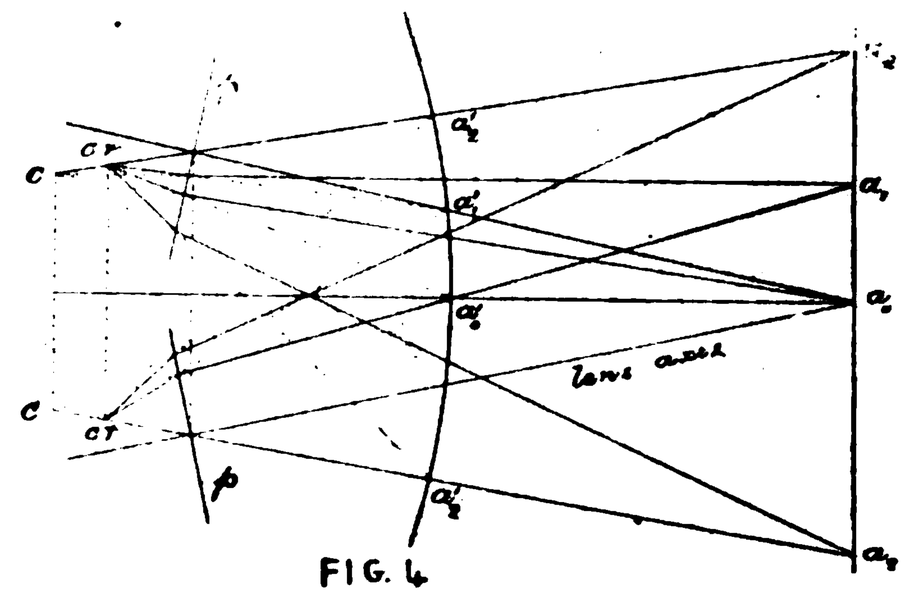


FIG. 4

a'_0, a'_1, a'_2. The rays a_2 cr c are undeviated. The image is convex towards the eye and much nearer to the eyes than in fig. 1.

In fig. 4 the axes of the lenses are directed to the point a_0, in which the median line meets the object plane so that the lenses are angled inwards and decentred outwards. The rays a_2 a'_2 c are undeviated. The image is now concave towards the eyes and is much nearer the eyes than the object.

In fig. 5 the lenses are angled outwards and decentred inwards. The rays passing through the middle point of the object, the centres of

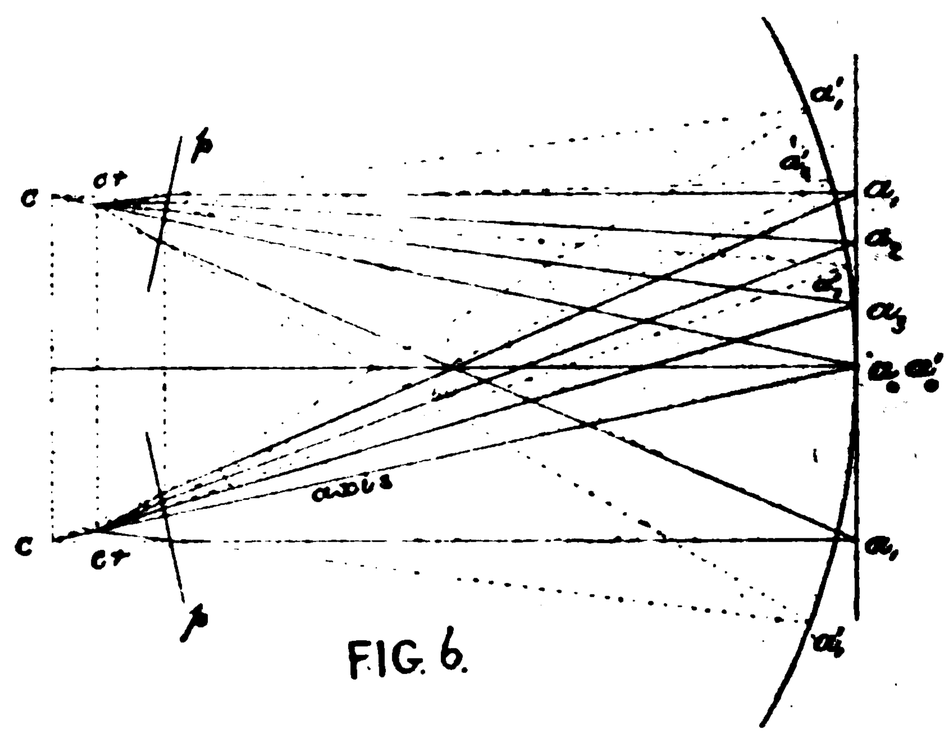
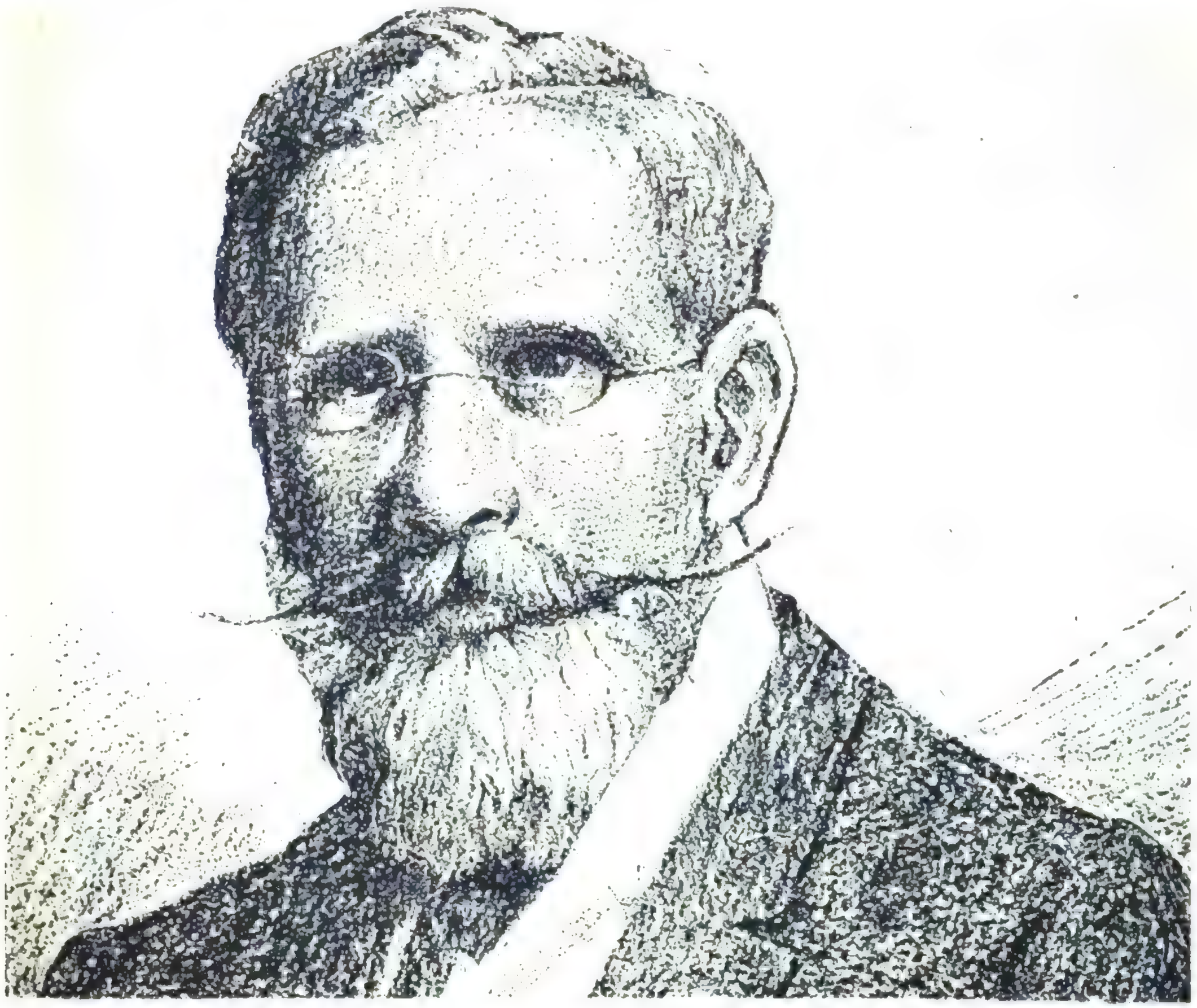


FIG. 6.

the lenses and the centres of rotation cr and their conjugate points c are undeviated and the object and image coincide at the point a_0 a'_0 where the median line meets the object

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



Chance's 'CROOKES' Glass

REMEMBER that the formula for a glass is only a part of it. Few other things than optical glass depend as much for their success upon the skill, experience and resources which are applied to their manufacture.

That is why ***Chance's*** is so essential a part of the title ***Chance's 'Crookes' Glass.*** None is genuine which does not come from these works.

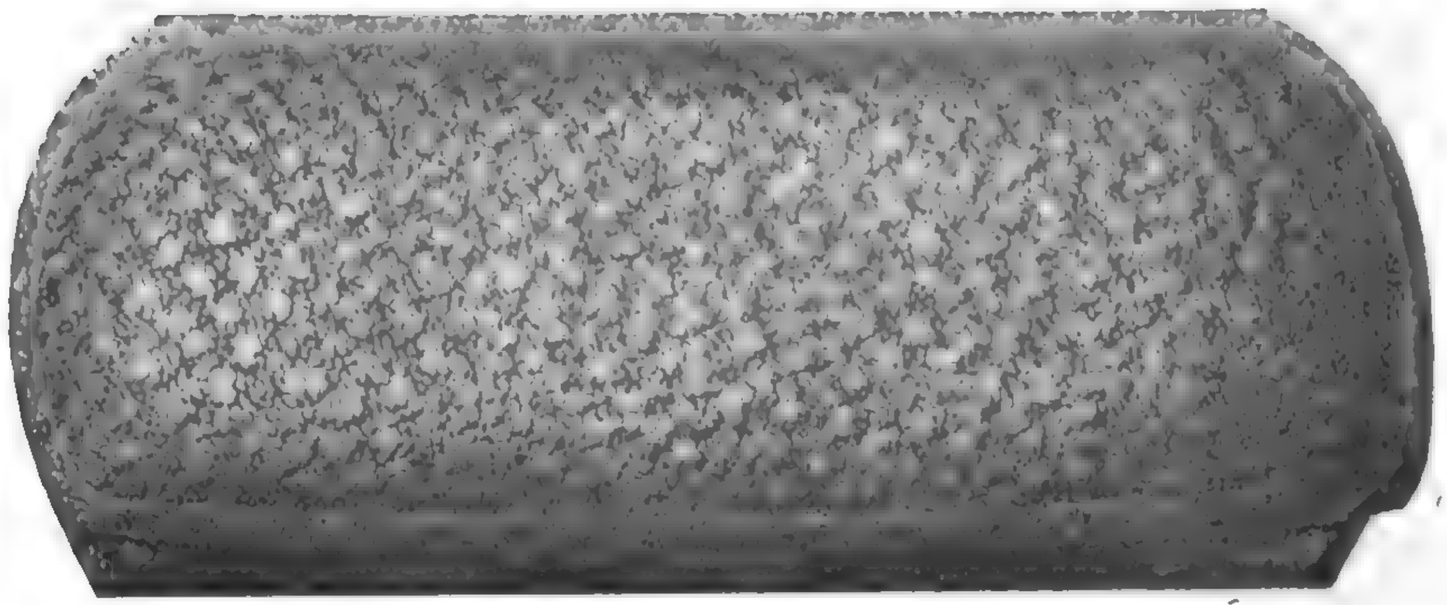
CHANCE BROS. & CO., LTD.,
GLASS WORKS, SMETHWICK, BIRMINGHAM.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"WERTEX" WILLMOTTS'

LOOKS LIKE LEATHER BUT WEARS BETTER AND COSTS LESS.



11c 11c

Satisfy your client by selling him a specimen of your skill, and then gratify him by presenting him with a specimen of ours.

Use "WERTEX" Cases.

Details and samples from your dealer or direct from the manufacturers.

WILLMOTTS LIMITED,

EVESHAM, WORCESTERSHIRE,

ENGLAND.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

plane. The outward angling makes the image surface convex just as in figs. 1 and 3, but in this case the edges of the image are further from the eyes than the outer parts of the object plane.

In fig. 6 the lenses are decentred inwards as well as angled inwards. The axes of the lenses intersect in the point $a_0\, a'_0$, in which the median line intersects the object plane. The rays $a_0\, cr\, c$ are undeviated. The object plane and image surface touch at a_0 and the image surface is concave towards

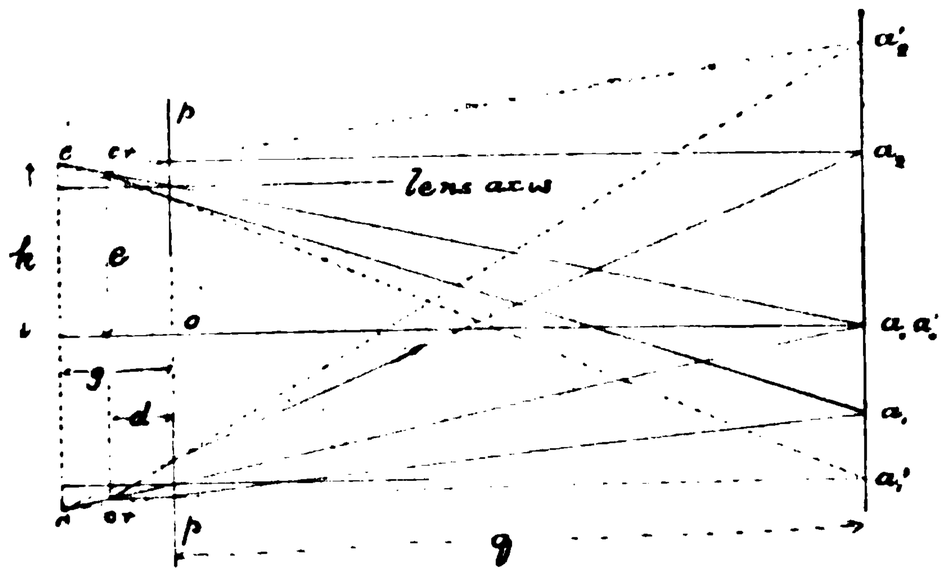


FIG. 7.

the eye the outer parts being nearer to the eyes than the object plane. Inward angling makes the image concave just as in figs. 2 and 4.

Consideration of figs. 5 and 6 leads one to suppose that if the lenses are angled neither outwards or inwards and if at the same time the axes intersect in the point in which the median line meets the object plane then the image will be a plane coinciding with the object. This arrangement is drawn in fig. 7. In the last article we found that with decentred lenses if the intersection planes and the object plane are at right angles to the median line and if the object plane is at a distance q from the origin the equation to the object plane was

$$x = q$$

and that of the image plane was

$$x' = \frac{q\, d\, k}{e\, g - q\,(k - e)} \quad \ldots \quad \ldots \quad (1)$$

where q, d, k, g, e have the values indicated in fig. 7. Now if the lines joining the centres of rotation and the centres of the lenses intersect on the median line at a_0 the middle point of the object plane we must have, by similar triangles on fig. 7,

$$\frac{k}{q + g} = \frac{e}{q + d}$$

or

$$q = \frac{e\, g - d\, k}{k - e}$$

Substituting in equation (1) we find that

$$x' = q$$

so that the object and the image have the same equation and therefore they coincide.

It is usual to decentre lenses for reading and very often they are angled inwards so that the axes af the lenses intersect on the median line at the object. The above results show that such an arrangement gives a concave field and that if the image of a plane object is to be plane then the intersection planes must be normal to the median line. The proper amount of decentration for reading at 30 cm. assuming the distance of the centre of rotation from the intersection plane to be 25 mm. and the interocular distance to be 60 mm. is from fig. 7.

$$\text{Decentration in millimeters} = \frac{30}{300 + 25} \text{ mm.}$$

$$\text{Decentration} = \frac{750}{325} = 2.3 \text{ mm.}$$

This is independent of the power of the lens.

New Companies.

Latters, Ltd.—Private Company.—Capital, £1,000 in £1 shares. To carry on the business of retailers of and agents for the sale of all kinds of drugs, chemicals, surgical instruments and appliances, photographic cameras, lenses, plates, films, etc. The first directors are:- C. C. Laver, "Little Bekkons," Beaconsfield, Bucks, and W. H. Lessiter, 80, Hunsdon Road, New Cross, S.E.14. Qualification: £50. Remuneration as fixed by the company. Registered Office: 46a, St. George's Road, S.E.1.

William Fox and Sons (Sheffield), Ltd.—Private Company. Capital, £5,000 in £1 shares. To carry on the business of wholesale and retail chemists, photographers, and opticians, etc. The permanent directors are:—Mrs. M. Fox, The Grosvenor, West Cliffe, Bournemouth, A. R. Fox (chairman), 15, Silver Hill Road, Sheffield. Qualification: £500. Remuneration: £300 each per annum. Secretary: A. R. Fox. Registered Office: 8, Castle Street, Sheffield.

C. A. Burdett (Chemists), Ltd.—Private Company. Capital, £300 in £1 shares. To acquire the business carried on at 14, Regent Street, Dawlish, Devonshire, and to carry on the business of chemists, opticians, dealers in photographic supplies, etc. The first directors are:— H. F. Stapley, 45, Craven Road, Hyde Park, W., and C. A. Burdett, 14, Regent Street, Dawlish. Qualification: 1 share. Registered Office: 14, Regent Street, Dawlish, Devon.

B

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Some Experiments in Artificial Skiascopy.

By E. MAYER (Paris).

The purpose of skiascopy is to find the conjugate focus of the retina. The way of reaching this result is to get the retina illumined by throwing light on it with a mirror. The dioptric system of the eye projects out a beam which, on account of the iris, gives an image partially shadowed.

In the following experiments which I call *artificial skiascopy* a black background is directly illumined by a circular lamp and a lens, either spheric or astigmatic, projects a beam in which the observer puts his eye. He can interpose at will a diaphragm and compare the effect produced by the lens alone with the effect of both lens and diaphragms. As we shall see herewith, this experiment will give a tangible proof of the well-known theory of true skiascopy and at the same time show the same particulars as either skiascopic shadow of a complete eye or of an eye devoid of iris.

A simple eye-piece of a terrestrial telescope will do without any cost. Fig. 1 is a front view and fig. 2 shows it in profile. The lens

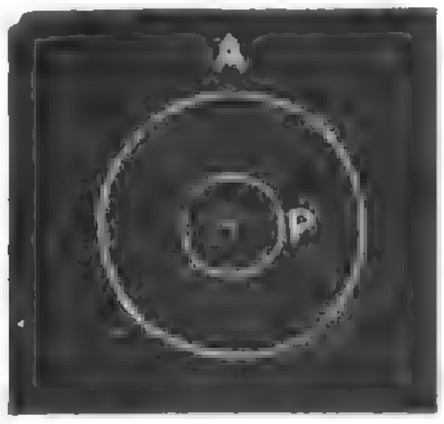


Fig. 1

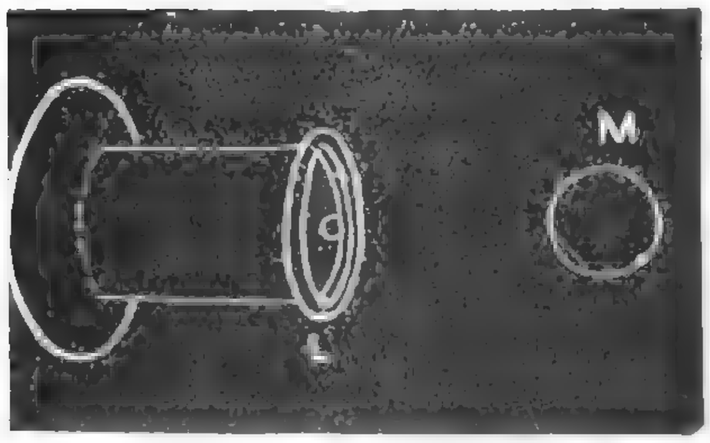


Fig. 2

L is put against the rear face *c*. The circular opening P is cut in the front face AB and the observer looks through it at the lamp M. No other lens is needed in the eye-piece.

There are several cases to be examined.

First Case.

Lamp M is between lens L and its object focus, for instance at 15 cm. from a lens which has a power of $+5^d,00$.

Image is virtual, erected and magnified. Lateral movement of lens in its front plane gives an against movement to the image. At the same time a crescent shaped shadow follows the image. This shadow, which is only a contrast between lamp and background, keeps the same curvature along its path: it is the curvature of image of lamp.

Now let us withdraw a little the lens and eye-piece from lamp, for instance about 2 cm. The image is still virtual. Its magnification is greater than before and its movement swifter, but it remains longer in the field of vision. The observer who sees only a part of the image is unconscious of these facts. To him, the movement of image seems less rapid than before because he sees successively different parts of image and thinks they are the same. But let us take away the diaphragm and the true movement will appear. In true skiascopy with a complete eye, the appearance of reflex is always fallacious as in this experiment with eye-piece.

Second Case.

Lamp M is further from lens than its object focus and observer is nearer from lens than the conjugate focus of lamp. For instance, lens of $+5^d,00$ is at 1m. from lamp and observer at 10 cm. behind eye piece.

If there were no observer, the lens would give an inverted real image at 25 cm. The observer's eye obstructs this beam and transforms it so as to give an inverted retinal image which shows to the mind an erected image. This one behaves as a virtual image although it is not a true virtual image. I shall call it a *pseudo-image*.

Lateral movement of lens in its front plane gives, as in the first case, an against movement to the image and to the shadow which follows it.

Let us withdraw both lens and eye from the lamp, but little enough to remain in the same case, for instance, about 10 cm. The image is still a pseudo one. Its magnification is greater than before, but as it is farther off one cannot say whether it looks greater or smaller. A calculation is needed to elucidate this point. Let us call:

f focal length of lens.

a linear dimension of lamp.

x its cardinal abciss,

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

W.H.T.

ACTIONS SPEAK LOUDER THAN WORDS

SEND US YOUR

Rx Work

AND BE

CONVINCED.

OPHTHALMIC SUPPLIES

OF EVERY DESCRIPTION.

Samples and Prices on Application.

WALTER H. THOMPSON

66 HATTON GARDEN, LONDON, E.C. 1.

Telegrams—LUNETTIER-SMITH, LONDON.
'Phone—HOLBORN 5713.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

THE Optical Pioneer of Scotland

We claim to be the First in Scotland to Institute an Efficient Rx SERVICE, the steady growth of which is ample evidence our efforts have been appreciated.

To meet our ever increasing clientele and insure Prompt and Efficient Service, we have just Completed Alterations and Improvements in our Workshops and Rx Departments and Invite your Enquiries.

Rx PRICE LIST ON APPLICATION.

Practically all Work Returned Same Day as Received.

The "Midg-Shur-Stop" Auto Eyeglass Chain

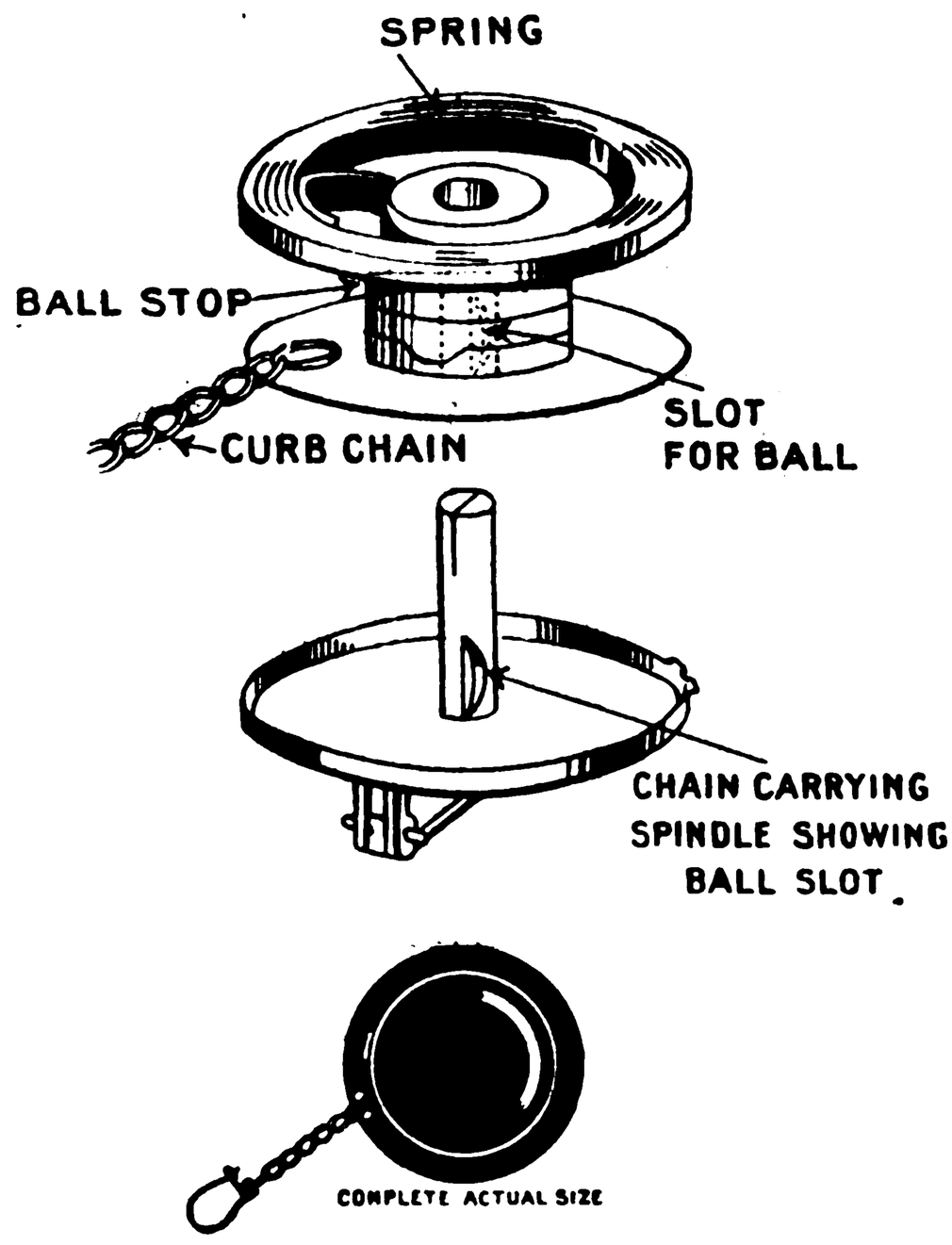
SIMPLE and RELIABLE. SOMETHING NEW. MODERATE IN PRICE.

The Working Parts as shown consist of Spring, Ball Stop and Slot.

THE ONLY Auto Chain on the Market which can be used with a CURB CHAIN.

Can be stopped instantly at any length of the Chain.

Nothing to get Out of Order.



Made & Stocked in the following patterns:

Polished Jap. Front Oxid Chain
" " " Gilt "
Dull " " Oxid "
Oxid " " " "
" " " Gilt "
Gold Plated Bright Front Gilt "
" " Matt " "
Antique Silver Front Silver "
Rolled Gold Bright Front R.G. "
" " Matt " "
Silvered Gilt Enamelled Fronts Silvered Chains.

Samples of any of above sent on approval on receipt of enquiries.

JOHN BAIRD,
Manufacturing Optician,
Telegrams: "SPECTACLES, GLASGOW."

"HERALD" OPTICAL WORKS,
68 & 70, MITCHELL ST., GLASGOW.
Telephone: CENTRAL 541.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

d abciss of observer's eye behind the lens.

A visual angle of image.

y its cardinal abciss.

The linear dimension of real image is $a\,g$ or $-\frac{a\,f}{x-f}$. The distance of real image to the observer's eye is $y-d$ and $y=\frac{f\,x}{x-f}$.

A is given by formula

$$t\,g\,A=\frac{a\,g}{y-d}$$

Then

$$t\,g\,A=-a\,\frac{f}{f\,d-x(d-f)}$$

If x increases, absolute value of $tg\,A$ increases provided $d-f$ be positive. No geometric figure could show it so easily.

At the same time as image is seen magnified, it moves more speedily when lens is moved laterally. This case is still the same as the first one. But it would not be so if $d-f$ were negative.

Third Case.

Observer is farther from the lens than the real inverted image of lamp. For instance, observer standing at 1 m. from lamp and looking through the lens at 50 cm. distance.

If he moves the lens laterally, the image gets a with-movement as well as the shadow that follows it.

Let us withdraw a little the lamp from the lens. Image recedes and lessens and its movement is less speedy. But the image remains longer in the field and seems to move more speedily. Let us take away the eye-piece and the illusion will disappear.

Fourth Case.

There is an important case between the two precedent ones. The image being real and inverted, the eye may be in the conjugate plane of lamp. Without the eye-piece, the image covers the whole observer's eye and if lens is moved laterally the image moves most speedily. But if the eye-piece be put anew, all motion is stopped. This illusion can be destroyed by marking dots on the lamp; they will move across the field, showing thus that the stopping of motion is apparent.

As soon as the lamp leaves the principal axis of the lens, the refracted beam leaves the place where the image stood. Then the lamp seems all at once to become extinct and there is no shadow following image.

All possible particulars are included in these four cases. They are true physical experiments. In a living eye, the same appearances and movements of image and shadow are observed by true skiascopy. The movement of lens is replaced by that of illuminated area of retina. The fourth case here mentioned corresponds to the point of reversal. The dioptric power of the eye being about $+60^d$, the observer always stands farther off than the principal focus and the condition $d-f$ · 0 is fulfilled.

All the particulars found in true skiascopy with an astigmatic eye can be obtained also with the eye-piece and an astigmatic lens.

The British Industries Fair.

With reports current on all sides of improving trade conditions, the greatest interest is being taken in the forthcoming British Industries Fair, the eighth of an unbroken series, which will be held from February 27th to March 10th next. The Fair, which is organised by the Department of Overseas Trade, will again consist of two sections, one for engineering commodities, at Birmingham, and the other for lighter goods at the White City, London. The two section will be held concurrently and in both cases the exhibits will be displayed under one roof, or rather under one series of roofs, for no one building is large enough to hold a complete section of the Fair.

A quarter of a million invitations to buyers in the United Kingdom are being issued by the Department of Overseas Trade, and nearly 50,000 have already been sent to buyers overseas. The Fair has also received considerable publicity overseas, and already a considerable number of overseas buyers have written intimating their intention to attend. A point of interest about the Fair is that it is entirely self-supporting, all costs of construction, maintenance, publicity and so on being borne by exhibitors.

The fact that all the exhibitors are actual manufacturers is of value to buyers, especially those from overseas, since it eliminates the confusion and waste of time which is apt to arise when the same goods are shown at different prices and in different parts of the Fair. Other advantages for overseas buyers include the free use of a club equipped with reading and writing rooms, and the free services of interpreters.

Some idea of the size of the Fair can be obtained from fact that at the White City alone 200 tons of timber and 15 tons of nails

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

have been used in the construction of exhibitors' stands, which cover 200,000 square feet of actual exhibiting space. These stands, which are being painted to suit the needs of individual exhibitors have absorbed 20 tons of paints and distempers. Over 10,000 asbestos panels each weighing half-a-hundredweight have also been used. The total area of the stand walls amounts to a quarter-of-a-million square feet, the frontage of stands alone being 3½ miles in length.

To protect the exhibits, each stand has a muslin ceiling, no less than 12 miles of muslin having been used for this purpose. The counters which form so prominent a feature of the stands involve the use of nearly 46 miles of cloth as covering, while floor-coverings amount to 22,500 square yards. In order to ensure adequate light for the whole of these vast preparations, 13 miles of ordinary electric cable and 12 miles of flexible cable have been installed. Through this 25 miles of wire will be conveyed the current to light 8,000 lamps. The lights are controlled through no fewer than one hundred and eleven fuse boards, and six miles of straining wire have been used to support this vast mass of electrical material.

An Industrial Exhibition.

The Fair has been certified by the Board of Trade as an Industrial Exhibition for the purposes of the Patents and Designs Acts, 1907 and 1919. Exhibiters desirous of availing themselves of the protection afforded by Sections 45 (1) and 59 (1) of the Act of 1907, as amended by the Act of 1919 should, before exhibiting their inventions or designs, or articles to which designs are applied, or publishing a description of such designs, have given the Comptroller-General of Patents, Designs and Trade Marks the prescribed notice of their intention to do so.

As previously, *The Optician and Scientific Instrument Maker* will be represented at a stall (G.1.) in the exhibition; and our representative will be pleased to make appointments there with members of the wholesale and manufacturing branches of the industry who may have come to town for the occasion, if there is any matter of trade publicity in which we can co-operate. Our telephone number at the exhibition is to be Park 5834.

To save unnecessary correspondence, we would add that exhibitors are not provided with tickets for distribution; and all applications from business men wishing to visit the Fair must be addressed to the Secretary, the British Industries Fair, White City, London.

The Funds of Approved Societies.

The Geddes "Axe" Report contains a mass of information that is of interest—largely melancholy interest—to the public in general. The following paragraphs, which deal with the surplus funds of Health Insurance "Approved Societies" available for distribution in additional benefits, are of some special interest to ophthalmic opticians, and therefore worth quoting.

"The recent Quinquennial valuation showed that, as, on the 31st December, 1918, in addition to the Central Fund of £2,000,000 referred to in previous paragraph, the individual Approved Societies held surpluses amounting in all to £16,000,000, of which roughly £7,000,000 is held in reserve and £9,000,000 is at the disposal of the Societies for distribution in additional benefits, etc. This disposable surplus of £9,000,000 will in due course attract a grant of £2,600,000, being the two-ninths proportion of additional benefits payable by the State. These surpluses are largely due to the war. Owing to the inclusion in the National Health Insurance Scheme of members of all ages a reserve value for each member had to be created. As the original members die the necessity for creating a reserve value disappears and the large number of war casualties has consequently improved the financial position of the Funds of Approved Societies. At the same time the death of these men has placed a burden on the Taxpayer in respect of pensions to widows and other dependents. Neither have the Societies had to incur additional expense as regards wounded men because they were recouped by the State in full any extra cost incurred in excess of what they would have had to pay in respect of an equal number of men under peace conditions—*i.e.*, they were entirely relieved of the special burden which war would otherwise have imposed on their funds, and, moreover, they reaped considerable benefits.

"As a result of the various modifications of the 1911 Scheme indicated above, the estimated Exchequer cost of National Health Insurance for Great Britain in the current financial year is approximately £10,500,000. The provisional estimate for 1922-23 is about £9,200,000. This reduction has been brought about largely by a reduction of 1s. 6d. (11s. to 9s. 6d.) in the doctors' capitation fee as from January 1st next. While we note this reduction, we consider it is essential that the State's share of the Health Insurance burden should be further reduced by legislation.

"This could be done by increasing the total contributions from employers and employed

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

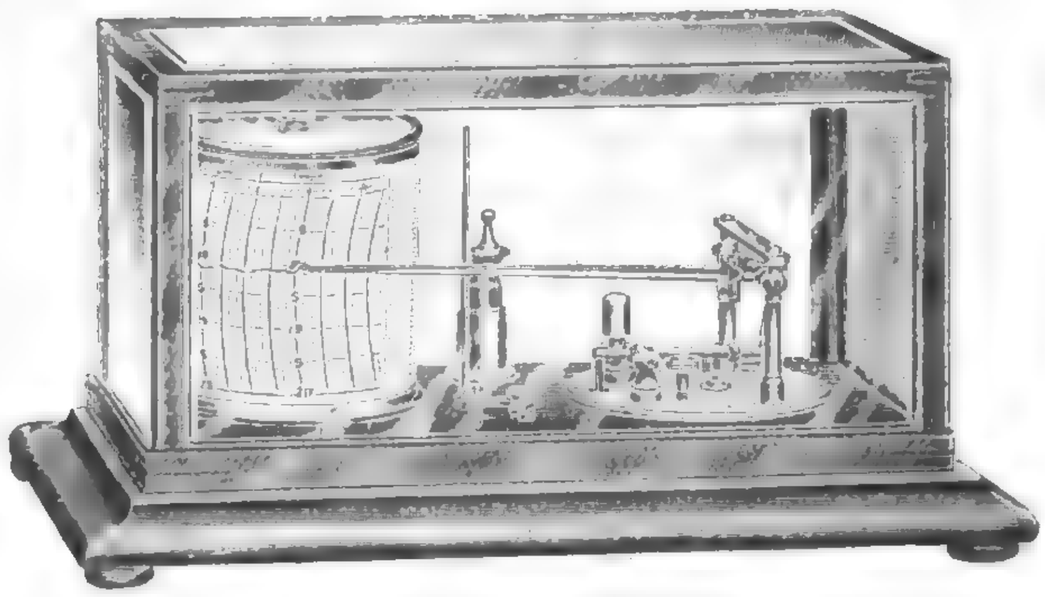
A POPULAR BAROGRAPH

of S. & M. Quality.

This first-class Recording Barometer combines an unusually high degree of accuracy with very moderate price. The Vacuum movement is concealed beneath the base plate, the whole construction being typically "S. & M." in quality and reliability. Available for prompt delivery, either in oak or mahogany case with glass cover, eight day clock and one year's supply of ink and charts.

The world-wide reputation of "S. & M." Scientific Instruments entails no penalty to the Retailer. Every sale shows a handsome profit.

Write for full particulars, terms and general booklet.



S. & M. No. 2318.

SHORT & MASON, Ltd., Aneroid Works, Walthamstow, London, E.17

TRY KIRK BROTHERS WHOLESALE & MANUFACTURING OPTICIANS FOR RX WORK

UNEQUALLED FOR PROMPTNESS & ACCURACY

OPTICAL REQUIREMENTS OF EVERY DESCRIPTION

Telephone: HOLBORN 1829 (Private Exchange). KIRK BROTHERS WHOLESALE & MANUFACTURING OPTICIANS Telegrams: KIRBROREX, HOLB. LONDON.

36, GRAY'S INN ROAD, LONDON, W.C.1

Digitized by Google Original from THE OHIO STATE UNIVERSITY

DUPAUL, YOUNG OPTICAL CO'S

Guaranteed Quality 1/10th 12 carat

"TUBULAR"

Finger Piece Mounting & Finger Piece Frames

are still recognised as the

BEST ON THE MARKET.

Insist on getting

DYO

Finger Piece Mounting and Finger Piece Frames

and you will be sure to obtain

"TUBULAR"

and NOT Coil Spring and Washer construction goods.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE: S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241**

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

"BISHOP EYEGLASS CHAINS"

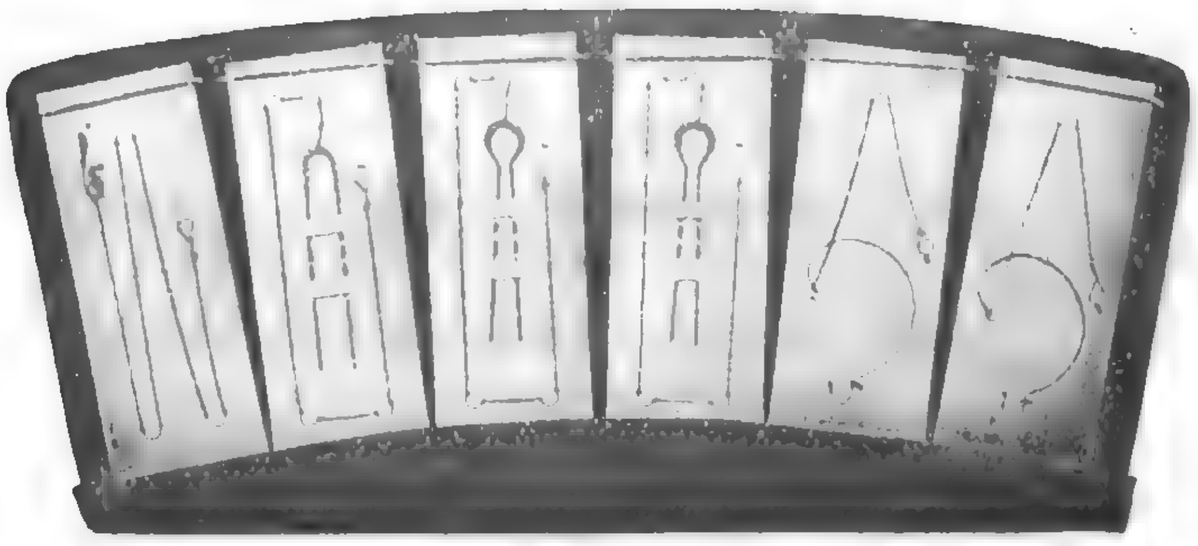
In Gold and Gold Filled

ALSO

SILK EYEGLASS & MONOCLE RIBBONS

are well known to the OPTICAL TRADE and have always been known to give satisfaction. Quality and Finish are evident in all goods of Bishop manufacture and the Bishop trade mark on all chain cards and boxes is your guarantee of absolutely dependancy.

Avoid substitutes, let "BISHOP CHAINS" be your standard of Quality.



THE BISHOP COMPANY,
North Attleboro, Mass.,
U.S.A.

To be obtained from all Wholesale Optical Houses.

LONDON OFFICE S. PULZER, 9, HATTON GARDEN, E.C.1

Telegrams: PULZONE, LONDON. **Telephone: CENTRAL 7241.**

Digitized by Google Original from THE OHIO STATE UNIVERSITY

TURNERY WORK
IN
EBONITE

Small turnery work of all kinds undertaken.
Rod and Sheet supplied in any quantity, cut to order. **Enquiries Solicited.**

BURGE, WARREN & RIDGLEY LTD.
91 & 92, GT. SAFFRON HILL, LONDON, E.C.1

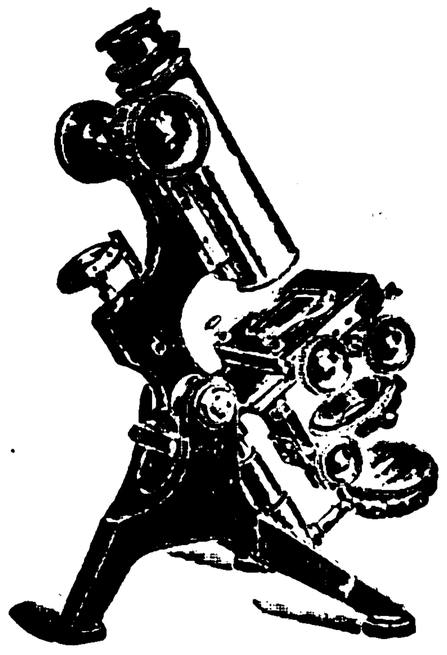
F. BARKER & SON, LTD.
SUNDIAL HOUSE,
12, Clerkenwell Road, LONDON, E.C. 1
MANUFACTURERS OF ALL CLASSES OF
SCIENTIFIC AND OPTICAL GOODS.
MANUFACTURERS OF
Aneroid Barometers, Compasses, Drawing, Mining, Surveying & Scientific Instruments of Every Description.

Registe
LONDON
Trade Mark
Estab. 1848

Illustrated and Descriptive Catalogue Post Free to any part of the World. Illustrated Booklet upon Sundials, Barometers and Compasses, Post Free. LISTS FREE.
Correspondence Invited. Bankers' and Trade References.
CLINICAL THERMOMETERS A SPECIALITY

SELL WATSONS' BRITISH-MADE
MICROSCOPES

NOW READY



New Catalogues:
Part 1—Students' Microscopes.
Part 2—Research Instruments and apparatus of every description for Microscopy.

All your customers are potential Microscopists. Add a lucrative side line to your business.

WATSONS' Microscopes are the best for the Amateur, the Student, and the "Research" worker.

Trade Terms on application.

W. WATSON & SONS, Ltd.,
313, High Holborn, W.C. 1
Works: High Barnet, Herts. Established 1837.

'Somco'

This trade mark signifies all that is best in Optical surfacing machinery, tools, gauges, etc. The material and workmanship in all goods of our manufacture is guaranteed unconditionally.

SURGICAL & OPTICAL MFG. Co.,
35, Charles St., Hatton Garden, London, E.C.1
Telegrams :—SUROPTO, SMITH, LONDON. *Telephone—2139 HOLBORN.*

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

by ½d. a week in each case, and we recommend that this change be introduced on July 1st next, before which date the contributions in respect of unemployed workers' dependents will have ceased. It would also permit of the abolition of the Exchequer grant for medical services, and we suggest that this should be considered."

Bibliotheca Chemico-Mathematica.

A unique and invaluable catalogue of works on exact and applied science has been issued by Messrs. Henry Sotheran & Co., 140, Strand, W.C. It is the first historical catalogue of scientific works published in any country, which gives both the current price for each book with bibliographical particulars, and many historical references in the notes. As a list of books actually for sale, it is believed to be nearly complete. There are 17,397 entries. The price is three guineas net. A number of the works of Newton, both Latin and English editions, are listed and described. Among the 127 plates in the book is one reproducing the title page of the "Opticks." Other plates show Daguerre's photographic apparatus, and diagrams from Kepler's "Dioptrice," etc. We have turned over the pages of the catalogue to note, below, some typical works likely to engage the attention of our readers; but this has been done only of course for the purpose of a review, as anything like a complete list of titles referring to mathematical, physical and applied optics, would occupy perhaps ten times as much space, and amount to a re-indexing of the index. A few books that attracted our attention as likely to interest readers of *The Optician and Scientific Instrument Maker* are the following:—Account of the Optometer for Adaptation of Glasses with a paper on Binocular Perspective, by Smee (1854); Achromatism of the Eye, by Prof. Baden Powell (1834); An Elementary Treatise on Optics, by Potter; Barometer Manual, also Instruction in the Use of Meteorological Instruments, by Scott; Comparative Anatomy of the Mammalian Eye, by Dr. G. Lindsey Johnson; Complete Works of Fresnel, who first established the undulatory theory of light on a basis of mathematical certainty, and whose investigations into the phenomena of interference, polarisation, diffraction, aberrations, and double refraction are of great importance; Curiosities of Light and Sight, by Shelford Bidwell; Dictionary of Solubilities, by Storer; Elements of Catoptrics and Dioptrics, by David Gregory, F.R.S. (It is noted that a remark in this volume as to the possibility of counteracting colour- aberration in lenses, by combining in them media of different densities, gave the first hint of the achromatic telescope—a suggestion which was realised in 1757 by Dolland's invention of the achromatic lens. The page containing the remark alluded to is reproduced from the original Latin edition); Essay on Visual Glasses, vulgarly called Spectacles, by Martin (1757), and various other optical works by the same author; Geometrical Optics, by Blakesley; Geometrical Optics, by Heath; Glass Blowing and Working, by T. Bolas (1898); Heliochromy, by Ducos du Hauron; Laws of Radiation and Absorption (Memoirs by Prevost, Kirchhoff, and Bunsen, trans. by Brace); Lenses and Systems of Lenses, by Pendlebury; Linkages, by Kent; Manufacture of Optical Glass, by Faraday, (1830); Mathematical Instruments employed in Surveying, by Simms; Meteorological Instruments, by Russell; On the Aberration of Light, by Gompertz; On the Chemical Action of the Solar Rays, by Sir J. F. W. Herschell; Pantometria, by Digges (invention of the telescope, 1591); Phenomena of Binocular Vision, by Wheatstone (1852); Photographic Optics, by Monckhoven; Reflexion and Refraction of Light, also an Elementary Treatise on Optics, by Coddington; Spectacles, Opera Glasses and the Pancratic Magnifier, by Dr. Kitchiner; Surveying Circle and Percentage Tables, by Fergusson; System of Opticks, by Smith; Telephotography, by Dallmeyer; Telescopic Vision, by Johnstone Stoney; The Gyroscope and Pendulum, by Major-General Barnard; The Polariscope, by Rolfe; The Slide Rule and How to Use It, by Hoare; The Theory of Screws, by Sir R. S. Ball; Theory and Practice of the Slide Rule, by Campbell; Theory of Optical Instruments, by Whittaker; Treatise on the Aneroid Barometer, by E. J. Dent, (1852); Use and Advantage of Spectacles, also Nature and Use of Spectacles with a kind of Glass for Spectacles preferable to any hitherto Used, by Ayscough (1750). As stated above, the titles we have selected exemplify those we think likely to appeal to the varied interests of our readers. Every optician who, because his science is mathematical, takes some interest in the exact sciences generally, will find in these two handsome volumes a mine of information as to many books that he will be wishful to acquire.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The Nature and Treatment of Strabismus.*

Dr. CHARLES DELOGÉ.

Oculists do not seem likely to agree among themselves on the nature and treatment of strabismus, despite the numerous treatises, some of quite recent date, which have appeared. The most varying opinions have been held and still find their convinced and authoritative defenders. The affection was, for some time, believed to be of muscular origin, thereby confounding it with deviation or squinting, which is an important symptom, but neither characteristic or always noticeable. Donders evolved really scientific explanations, and though their value must not be exaggerated, it is certain that they are one of the greatest steps towards progress which has been accomplished. Javal, in turn, devoted a highly interesting volume of minute observations and documents to the theme.

Parinaud finally enlarged on the conceptions of his predecessors, and decided that strabismus was a faulty development in the apparatus of binocular sight. His opinion has become classic, and his masterly ideas have been exploited in the interesting work of Sauvineau. The given theory of a complaint has not alone an historical interest. It is generally admitted that any belief, be it true or false, gives rise almost always to appropriate actions. That is the case with strabismus, the treatment of which, after an entirely medical period, has become almost exclusively surgical; it has now entered a mediesurgical phase.

The subject has been treated so fully and repeatedly by so many eminent men that it may be pretentious in a newcomer to risk a few criticisms. Our excuse is, that in coming after them, we have profited by the ingenious apparatus our illustrious predecessors lacked. The ideas which we in turn, express are the result of numerous observations made either in hospital or among our patients. We have been helped in the long and difficult work by the valuable counsel of Prof. Lapersonne, our tutor, and the frequently recalled advice of Dr. Rémy, the inventor of the diploscope.

Dr. Rémy[1] made his first experiments in the year 1901; since then some modifications of detail have been added to the diploscope, by several oculists and by himself; but these modifications have not altered the first conception, and the ingenious apparatus remains practically the same. The diploscope essentially consists in a large tube, closed behind by a plate moving on its own axis. This plate is pierced by four separate holes, one at 4, the others at 6 centimeters. Two openings only are visible at the same time, owing to the action of the operculum. The apparatus is placed horizontally on a stem of 1.25 m., ending at one end with a chin support, or two eye holes, and at the other with printed letters, of which the number varies, according to the nature of the experiment, between 2, 3 or 4. The rotation of the plate allows the numbers



Fig. 1.—The four-letter experiment for normal eyes. R. and L. are seen by the right eye. O. and A. by the left eye. The two openings furthest apart are placed horizontally for this experiment.

to be seen horizontally or vertically. Dr. Rémy has also constructed a smaller diploscope, differing from the preceding model, by its lesser length and the absence of the tube. The following illustrations will, we think, facilitate the comprehension of the simple technic of the apparatus.

The slightest alterations in binocular sight are immediately recognised by the displace-

[1] Delogé, Arch. d'Opht., Dec., 1904.

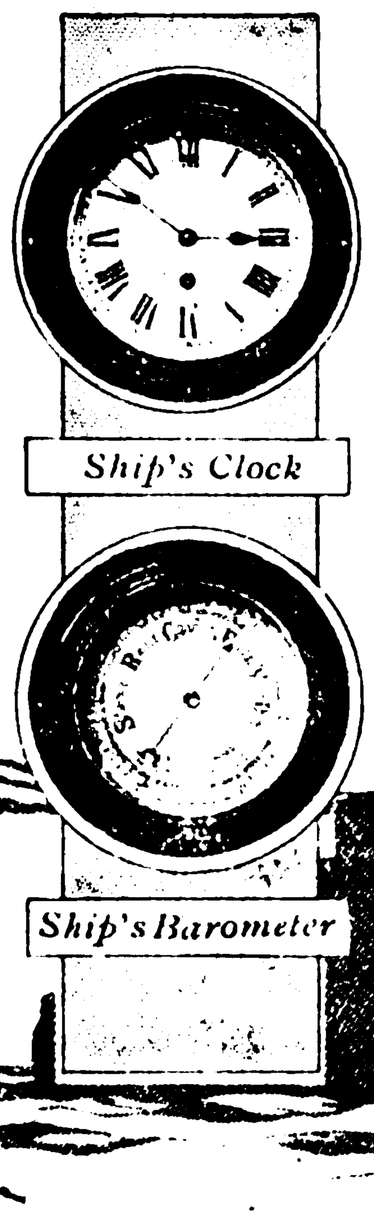
* Copyright in U.S.A. by the 'American Journal of Ophthalmology.'

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

T. A. R. & Co.

"THE ALL BRITISH HOUSE."

Over 2,000 Designs in Aneroid Barometers.



Time and Tide
And Ship's Instruments



T.A.REYNOLDS & Co
40-1-2 PERCIVAL STREET,
LONDON E.C.1



Steam-pipe Thermometer *Hydrometer*

Telegrams—
"THERBAROME. LONDON."

Telephone
339 CITY.

Showrooms and Offices at above address.

If you are a Retailer and need ORIGINAL LINES in Barometers, Clocks and Thermometers, write us, and although we will not supply you direct, we will put you in touch with the Nearest Wholesale House.

WHOLESALE AND SHIPPING TRADE ONLY.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

To ensure Your Clients being Satisfied

there are two essentials; your ability correctly to diagnose eyesight defects and prescribe accordingly, and a knowledge of the right place to which to send your Rx work.

The first can be taken for granted. The second essential is fulfilled by making it your rule to consider **L.O.C.** as your Rx Head-quarters. Up-to-the-minute equipment, keen and loyal workers, a triple inspection system to prevent errors, plus an appreciation of the problems of the Sight-testing Practitioner, enable us to satisfy you and all our clients.

Telephone: MUSEUM 4572

LONDON OPTICAL Co.,

Offices and Works:

344/354, GRAY'S INN RD., LONDON, W.C. 1

Factory—CROMER STREET, LONDON.

Branch—6, Rue de la Pepiniere, Paris, France.

Also at—2, Str-Bursei, Bucharest, Roumania.

Telegrams: Locoptical Kincross London.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

ment of the letters, which no longer appear in their normal place, but in crossed diplopia if there be divergent strabismus, or in homonymous diplopia, if the strabismus be convergent.

We shall not dwell upon the great developments of Parinaud's[2] theory, only we must insist on the fact that according to this author, strabismus is always an affection of childhood. In any case, his definition is extremely explicit. It is a question of "a flaw in the development of the apparatus of binocular sight, preventing the convergence of the eyes upon a fixed object." It is a disorder of central control in the reflex of the convergence. If this last be exaggerated, there is convergent strabismus; if it be lessened, divergent strabismus supervenes. The cerebral trouble itself may be primitive, and may, by that fact, prevent binocular sight, or it may



Fig. 2.—Three-letter experiment for normal eyes; K. and O. are seen by the right eye. O. and L. are seen by the left eye. If the bar placed vertically in front of the tube is lowered, O. alone continues to be seen by both eyes, K. and L. having their rays intercepted. The two nearer openings are placed horizontally for this experiment.

supervene early and impede normal development. (Parinaud, pp. 19, 48, 50, 98, 115, 124). M. Sauvineau,[3] in adopting this idea, wishes to localise the cerebral trouble more precisely still, to the centre of the convergence (Sauvineau, loc. cit., p. 146).

Thus strabismus, which was according to savants a local affection of visual or muscular origin, became, according to Parinaud, an affection of the central control. The superiority of this conception over its often inadequate precedents cannot be ignored. It appears to be not only the most natural but the only probable explanation of certain forms of strabismus, more particularly those which supervene when optical causes are at fault. Two children possess the same refraction, the same visual acuteness, one has a direct gaze and normal binocular sight, while the other is strabismic. There must be a cause for the latter condition, and since it does not exist in the eyes, it must be sought elsewhere, that is, in the brain. Strabismus is, so to speak, the sign of organic decadence, a stigmata of degeneration.

The important part played by all sorts of infectious maladies, measles, scarlatina, typhoid fever, in the case of the child, is thus wonderfully explained. Convulsions, it is well-known, are frequent in the previous life of the little strabismic. Prof. Fournier and Dr. Antonelli have, on their side, pointed out, perhaps rather immoderately, the importance of syphilis in the progenitors; also, there is the question of consanguineous marriage, or of alcoholism. To sum up, it seemed probable that all causes capable of bringing nervous troubles, could in a certain measure disorder the delicate machinery of binocular sight.

A Nervous Affection.

The nervous theory of Parinaud would, if necessary, serve a clinical argument. Strabismic children are often not only irritable and nervous subjects and actual neuropaths, but strabismus itself presents at times considerable individual differences. All those who have treated children know that though strabismus may rapidly improve under the influence of glasses and atropin, there are unhappily fairly numerous cases where the best informed usual therapeutics show themselves particularly inefficacious, whether they be applied to the generally convergent form of the strabismus itself, or to the pre-existent nervous cause.

But if Parinaud's theory throws a new light on cases of strabismus that supervene where the child's eyesight is almost normal, it becomes less necessary, though still very useful, in explaining the form of strabismus that

[2] Parinaud, Le Strabisme et son traitment, Paris, 1899, O. Doin.

[3] Sauvineau, Bull. de l'Acad. de Med., v. 81, p. 789.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Donders has attached to refraction troubles, and principally to the discord they establish between accommodation and convergence. In fact, the greater part of these strabismics generally give way fairly quickly to suitable optical treatment. Consequently, it becomes difficult to determine the part of ametropia and that of the nervous system, in the evolution of the ocular affection. The interpretation may become singularly embarrassing, and a minute examination of the subject and its antecedents will be found necessary to specify the etiology.

Regarding strabismus in the adult, Drs. Parinaud and Sauvineau are most discreet. If they speak of it, they call it an old strabismus, or explain it by a nervous anterior predisposition. Our intention is to show precisely that this affection can supervene among individuals whose binocular sight is perfectly developed, and without necessarily being connected with special nervous influences. This variety of strabismus is a particularly interesting study, because it is peculiar to adults, and its evolution can, so to speak, be easily followed from day to day. But, before we go into the numerous points which form the basis of this study, it would not be uninteresting to come to terms with strabismus itself.

[To be continued.]

Before the Wealdstone magistrate on Monday last an application was heard on behalf of a man confined in Brixton jail, as to whether he might have his spectacles, so as to read the newspaper. His application was granted subject to the approval of the prison authorities.

In a finely contested match at Lordship Lane, Dulwich, on Saturday, the 11th inst., St. Martin's Sports F.C. defeated Bondwell (C. W. Dixey & Son) by 3—1. The "Bees" were without three of their regular players. The opening exchanges were fast and even, the home team accepting all scoring opportunities. The "Bees" were the more aggressive side up to half-time, and for practically the whole of the second half they penned St. Martin's in their own territory, but so admirably did the defence acquit itself, that the "Bees" could only score once. The forwards wasted many chances by passing instead of shooting when within the penalty area. Play continued fast and exciting to the finish. On Saturday, Feb. 18th, Bondwell F.C. oppose Union Athletic F.C. at home, Lea Bridge Road. Supporters meet at Radley's Boathouse. Kick-off, 2.45 p.m.

Letters to the Editor.

It must be understood that the Editor does not necessarily endorse the views or accept responsibility for the statements of correspondents and contributors. Letters dealing with controversial topics—as personal matters or "trade" politics, etc.—should be signed with name of the writer in full. The Editor reserves the right to modify or cut out from printed correspondence any passages considered legally objectionable.

A Lunar Halo.

Sir,—Can any of your readers furnish an explanation of the fascinating halo which encircled the moon on Wednesday evening, February 8th? I only observed it between 7 and 8 p.m., but I understand it was visible for sometime before and after this period.

The sky was clear and starlit; the moon was exceedingly bright, and the encircling halo was of enormous dimensions, as a pinpoint might be to a disc of six inches or more.

The halo was a gorgeous blue black, vastly brighter than the bright sky and starless, with a clearly defined white rim, tinged with a pinkish suggestion. I have never observed a phenomenon of similar character.

LUNAR.

Hitchin.

Qualification in Optics.

Sir,—Some years ago a writer to your paper—an employer—recorded that he had found the qualified opticians hopelessly inefficient. I think he was told that the grapes were sour.

I see this week in your journal, letters in which the writers apparently take it for granted that, because a man has passed an elementary examination, he is therefore a capable optician, I do not think it would be difficult to prove that this is not so.

How often has one seen advertisements in your paper, such as "Qualified optician seeks position, where he can gain experience," and even "instruction." I certainly agree that many of them need both. I remember one of our apprentices at [illegible] passed the B.O.A. and he had never had a case of sight-testing in actual practice.

I think that some of your correspondents might have a look at a list of Fellows and Members of the Optical Society. It is absurd to say that these men are not somewhat more than on a level with many qualified opticians.

H.C.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

'Stoco' Optical Machinery

Torcyl. Machines.

Spherical Surfacers with Automatic Polishing Attachments.

"Acme" Rimless Edgers.

"Simplex" Rimless Edgers.

Cutting Machines.

"Kutsall" Diamond Attachments.

"Acme" Drilling Machines.

Hand Tapping, and Broaching Machines.

Spherical Laps, Gauges, etc., etc.

All in stock and thoroughly inspected, ready for immediate delivery.

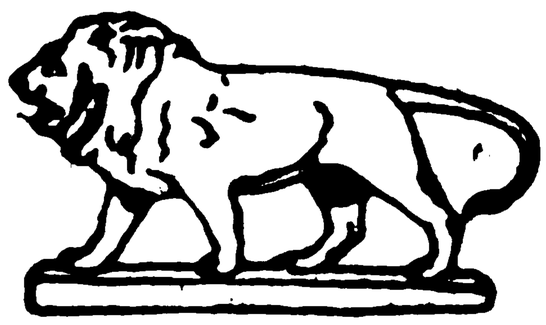
SPECIALLY REDUCED TERMS FOR CASH BUYERS FOR THIS MONTH ONLY.

F. H. C. Lyon,

Wholesale and Manufacturing Optician,

59-61, Hatton Garden, London, E.C.1

Telegraphic Address:
CYLTORREXO, SMITH, LONDON.



Regd. Trade Mark.

Telephone No.:
HOLBORN 1203.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Scientific Instrument Makers.

MICROSCOPES of all kinds manufactured at our own works.
REPAIRS to Prismatic and other Binoculars etc., promptly executed.

H. H. SHARLAND (H. KEMP),
9 & 10, THAVIES INN, HOLBORN CIRCUS, LONDON, E.C.
Tel.: Holborn 1840. Established 1860.

Every Description of Ophthalmic Supplies.
All Requirements of the up-to-date Sight-Testing Optician.
Good Special Lines at keenly Competitive Prices.

Telephone **JAMES B. SLY,** Central 10280.
9 & 10, EDWARD ST., WARDOUR ST.
LONDON, W. 1

To S.M.C., B.O.A. & I.O.O. DIPLOMA HOLDERS

Oak frames and modelled gold Arms for the diplomas The Arms of the S.M.C., City of London, and devices of the I.O.O., B.O.A. and Ph. Society in water colours, and framed dark oak, with descriptive engraved plate affixed, 27/6 each. Packed and put on rail.

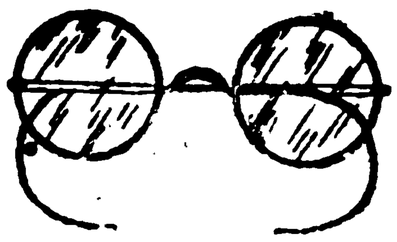


Printed & Embossed Optical Stationery.
Steel Dies for use of Diploma Holders.
Electros of Coat of Arms & Optical Devices.
Engraved Seals, Prescription Forms, Signs, etc.
Price List on application.

Electro No. 12 Price 3/6

MANY SUCCESSES IN THE EXAMINATIONS!
Your Opportunity to
QUALIFY IN OPTICS
PRACTICAL WORK. Students taking the Course may receive personal tuition in the practical work AT ANY TIME DURING THE COURSE.
Expert Tuition by Correspondence for the SIGHT-TESTING DIPLOMAS of the Worshipful Company of Spectacle Makers (F.S.M.C.), or the British Optical Association (D.B.O.A.).
Write for full particulars—
C. A. SCURR, M.P.S., F.S.M.C., F.I.O., etc.
64, High Street - - - - BARNET.

FUSED BIFOCAL a better blank than ever before and a better price. Send for samples and prices. These blanks enter free of duty in the United Kingdom.
STERLING ACCEPTED AT PAR.
COMMERCIAL OPTICAL CO., Montreal, Que.
Box 443. Cable: 'Optical." A.B.C. Code 5th Edition.



OPTICAL BLOCKS
To illustrate all features of Optical Service. Write for Lists.
CHEMISTS' DESIGN SERVICE,
12, Humberstone Gate, LEICESTER.

PERCY S. DE SAULLES.
Manufacturer of . . .
MICROSCOPICAL GLASS SLIDES.
Micro Cover Glasses, Glass Cells and Cavity Slips, etc.
The Platts, Amblecote, Stourbridge.

BAKER 244 HIGH HOLBORN LONDON
Estab. 1765

Do You Handle Kodaks?
The "Metron" Plate Adapters, if stocked, will mean a large Increase of Business.
PARTICULARS AND TERMS ON APPLICATION

W. P. THOMPSON. F.C.S., M.I.Mech.E., F.I.C.P.A.
C. G. DYMOND. M.I.Mech.E., F.I.C.P.A.

W. P. THOMPSON & Co.,
12, CHURCH STREET, LIVERPOOL.
Chartered Patent Agents.

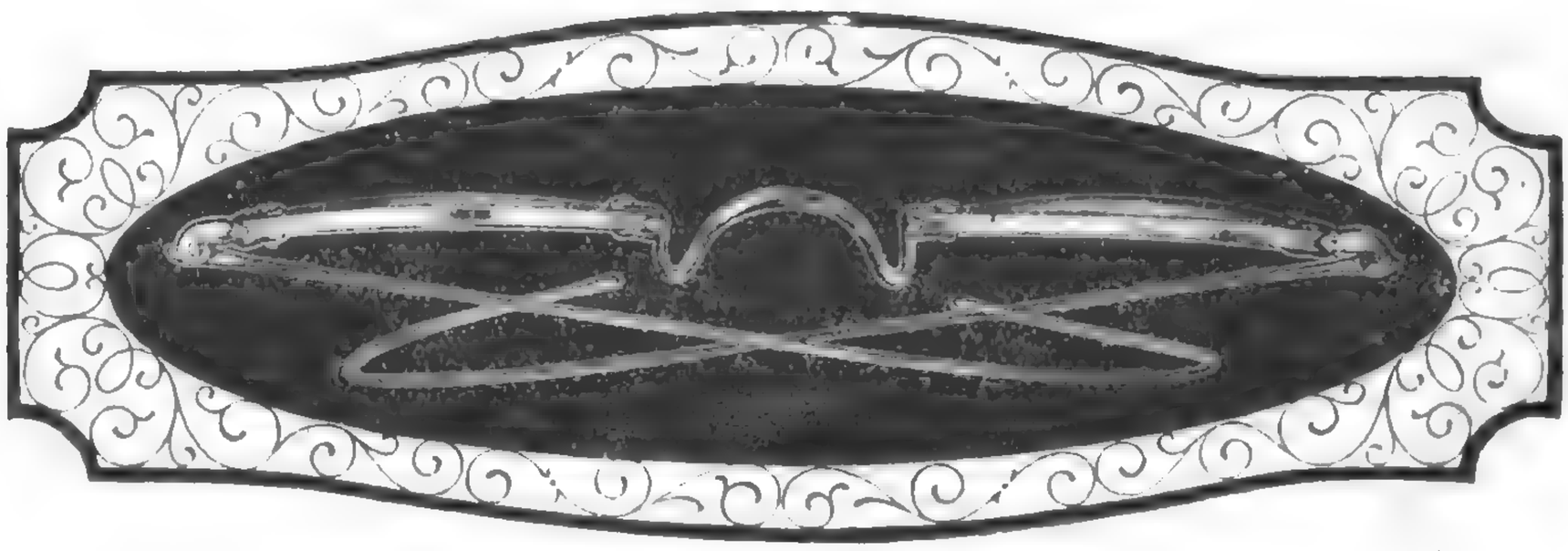
H. E. POTTS. M.Sc., Hon. Chem., F.I.C.P.A.
J. V. ARMSTRONG. M.T.I., F.I.C.P.A.

T. WHEELER,
Scientific Instrument Manufacturer,
Specialities: POCKET SURVEYING and AERONAUTICAL ANEROIDS.
217, GOSWELL ROAD, LONDON, E.C. 1
ESTABLISHED 1878 TELEPHONE CITY 419

The Optical Society.
President: Mr. R. S. WHIPPLE, M.I.E.E.
Vice-Presidents: Prof. FREDERIC J. CHESHIRE, C.B.E., Director of the Technical Optics Department of the Imperial College of Science and Technology, South Kensington; Sir HERBERT JACKSON, K.B.E., F.R.S.
Hon. Treasurer: Mr. I. G. AITCHISON, B.A., LL.D.
Hon. Secs.: Mr. L. C. MARTIN, B. Sc., Imperial College of Science and Technology, South Kensington S.W.7 and
Papers' Secretary: Mr. F. F. BRYSON, M.A., B.Sc.

SPECTACLES & EYEGLASSES.
Their Forms, Mounting and Proper Adjustment
by R. J. PHILLIPS, M.D.
Fourth edition revised with 56 illustrations.
Price 6s. 6d. Post Free 7s.
THE HATTON PRESS, Ltd., 125, Fleet Street, London, E.C.4

Digitized by Google
Original from THE OHIO STATE UNIVERSITY



The Sroco

Rimless Spectacle Mounting

Graceful and quietly dignified, this Sroco mounting appeals instantly to that considerable proportion of your patrons which prefers unobtrusive quality to bold design. It is furnished in solid gold and gold-filled in medium, heavy, and extra heavy weights with any regular temple. Your wholesaler either has it in stock or can obtain it for you promptly.

Manufactured by

THE STANDARD OPTICAL Co.,

GENEVA, N.Y., U.S.A.

Makers of High Grade Frames, Mountings, Lenses and Optical Machinery.

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

Candidates for the Examination of the **Worshipful Company of Spectaclemakers** can always be certain of receiving the most thorough and painstaking preparation at

THE SCHOOL OF OPTICS, LTD.,

Under the direction of Mr. LIONEL LAURANCE (Official instructor to the Company) and Mr. H. OSCAR WOOD.

General Optics, Visual Optics and Sight Testing.

The percentage of successful students AT THE FIRST ATTEMPT is consistently high.

Correspondence Courses, Afternoon and Continuous Day Classes.

Particulars on application to—

2, GUILFORD PLACE, LONDON, W.C.1

VISUAL OPTICS & SIGHT-TESTING

By LIONEL LAURANCE.

A New Edition, just out. Price 21s. 21s. 9d. post free.

GENERAL AND PRACTICAL OPTICS

By LIONEL LAURANCE.

A New Edition. Price 21s. 21s. 9d. post free.

The two ideal books for the acquirement of a knowledge of the subjects indicated by their titles.

THE HATTON PRESS, Ltd.,
125, Fleet Street, London, E.C.4

A New Optical Publication.

"PRESCRIPTION PITFALLS

and How to Avoid Them,"

By HENRY C. RAXWORTHY
("Obfuscando")

ONE SHILLING AND SIXPENCE.

No Retailer or Wholesaler should be without a copy. An entirely original work.

Published by The HATTON PRESS, Ltd.,
and obtainable of all wholesalers.

The Optician's Handbook.

Price 4s. 0d. Post Free.

An elementary text book required by every student of Optics.

It is an introduction to "The Study of the Refraction of the Eye, its Anomalies and their Estimation and Correction by means of Glasses.

The Hatton Press, Ltd.,

125, Fleet Street, LONDON, E.C.4

BRITISH OPTICAL INSTITUTE, LTD.,

(College of Optics).

Complete Training for the Sight-Testing Optician.

Supplementary to the usual Daily Classes and Correspondence Courses, a series of Evening Classes is held, for those desirous of preparing themselves for any of the Optical Examinations.

A Course of Weekly Evening Lectures, and Demonstrations, for candidates for the F.B.O.A. Examination, and for post-graduates, has also been arranged.

Clinical Classes.

are held on two afternoons a week, and give Students the special advantage of meeting actual cases, generally of particular interest.

The whole work of the Institute is carried out under the supervision of the Principal, assisted by Mr. Geo. Colebrook, F.B.O.A., F.S.M.C., (Master's Prizeman).

For full particulars apply to:—The Principal, Dr. MAX COGUE, B.Sc., Fern Lodge, 20a, Grove Road, Brixton, S.W.9
Telephone: Brixton 677.

THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER

Subscription Form. **123-125, Fleet Street, London, E.C.4., England.**

Send a copy each week of THE OPTICIAN & SCIENTIFIC INSTRUMENT MAKER post free for which we enclose .....shillings for.....weeks.

UNITED KINGDOM 17s.
and ABROAD 20s.

Name.....
Business.....
Address.....
.....

A remittance of 17s. (or 20s. Abroad) for 52 issues includes "THE OPTICAL ALMANAC" post free.
Cheques made payable to The Hatton Press Ltd.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Shur-on Cases

Included among the more than 996 members of the Shur-on family of optical products (Quality Beyond Question since 1864) is a complete and distinctive range of eyeglass and spectacle cases, of every type, material and style—cases which, from design to finish, bear the mark of the master optical craftsmen.

Represented are many grains and shades of leather and Imo leather, including *flexible* goggle cases in tan cowhide and grey suede.

If you *are* particular and are banking on the goodwill and word-of-mouth advertising of your patrons—you *will be* critical and say "SHUR-ON" to your wholesaler.

Shur-on Optical Co.,
Rochester, N.Y. U.S.A.

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Wanted to Purchase and Sell.

Prepaid charge for advertisements under these headings 1s3d. per word: for replies under Box No. 8d. extra.
Address of Office must be calculated as six words.

WANTED, second-hand travelling trial case, mounted lenses in good condition. Reasonable cost. Box 3530, c/o "The Optician," 125, Fleet Street, E.C.4.

FOR SALE, 4-Spindle Lens Polishing Machine by Bryant Symons in perfect order. A. Gasson, 52, Battersea Park Road, S.W.11.

SMALL Toronto Automatic Rimless Edging Machine, 1 to 6 lenses, power ⅛ h.p., 450 R.P.N. First grade Alundrum Stone, Trueing device, splash guard. Price on application. F. J. Witts & Co., 183, Victoria Street, London, S.W.1.

FOR SALE. Half-plate stand camera, mahogany, 10" ext. Beck-Steinheil Unofocal Ser. 1., No. 5., f/6 with Beck Celverex shutter, T.B. to 1/80 sec., 3 mahogany double dark slides, stand, focusing cloth, waterproof case, the whole £3 10s. Also ¼-plate Holborn reflex, magazine 12, Ilex, R.R. f/77. T. and I to 1/100 sec. Leather case, £2. Please address, Box 3508, c/o "The Optician," 125, Fleet Street, E.C.4.

WANTED, Book "System of Applied Optics," by Dennis Taylor. Offers to Box 3469, c/o "The Optician," 125, Fleet Street, E.C.4.

MICA (or Talc).—F. Wiggins and Sons, 102, 103, 104, Minories, London, E.1.—Speciality, Mica for Compasses. Telephone: 2248 Avenue.

Partnerships and Businesses.

£750 will secure half share in established optical business, North of England, turnover 1921, over £2,000. Splendid opportunity for qualified gentleman, ambitious and not afraid of work. Apply, first instance to Box 3520, c/o "The Optician," 125, Fleet Street, E.C.4.

OPTICIAN'S Business, large Lancs. town, for immediate disposal. Suit young energetic man with small capital. Box 3525, c/o "The Optician," 125, Fleet Street, E.C.4.

Employment Bureau. *Concluded from page 8*

YOUNG MAN (22) seeks situation anywhere. Spectacle maker, specials, repairs, any metal. Quick, willing. Gee, 43, Fentham Road, Handsworth, Birmingham.

SITUATION required for youth recently left school. Wholesale or retail. Apply, Box 5878, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS Framemaker and jobber seeks situation. Able to take charge, good reference. London or suburbs, W. S., 134, St. Thomas Road, N.4.

OPTICIAN with well equipped workshop, skilled prescription hand, offers to undertake work from few other opticians at reduced prices. Box 5877, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUTH Wanted for stock room with prescription experience preferred. Box 5876, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED Sight-testing optician requires appointment, fully qualified, possessing sound knowledge of optical instruments, capable of controlling and increasing business. Box 5875, c/o "The Optician," 125, Fleet Street, E.C.4.

YOUNG MAN requires situation with sight-testing optician, 3½ years' experience (including apprenticeship). Good references. Box 5874 c/o "The Optician," 125, Fleet Street, E.C.4.

ABLE and energetic assistant wishes to get in touch with retailer requiring same. Young, and good sight-testing experience. Box 5884, c/o "The Optician," 125, Fleet Street, E.C.4.

MANAGER requires position, long experience sight-testing, objectively and subjectively, and general optical work. Excellent salesman, take entire charge. Address, Box 5883, c/o "The Optician," 125, Fleet Street, E.C.4.

CONFESSIONS

From confessions made we have discovered that in many cases, when a man sends to us for the first time, he does so in a dubious spirit—and we can understand it.

■ ■ ■

Words are one thing, deeds are another. We have all had our disillusionments and it is not always possible to accept a statement simply because it appears in print.

■ ■ ■

We claim that there is no quality better than W.O.W. and to give a quick and reliable Rx service at prices which save you money.

■ ■ ■

A bold assertion!!—but more and more Opticians are finding the truth in it and we are repeatedly having the pleasure of proving our case to men who doubted (rightly so) at first.

■ ■ ■

Our case. That it is possible to pay less and yet obtain the very best of quality and service. Think about it.

WILLESDEN OPTICAL WORKS, LTD.

LENS FACTORY:
DUDDEN HILL LANE, N.W.10

The Optical Almanac

A HANDBOOK and DIARY CONTAINING

Useful Information.

Trade Addresses.

Syllabus of the S.M.C. with classified list of diplomates.

National Association of Opticians Directory.

Society of Chemist Opticians Directory.

Tables of Whitwell Best Form Lenses, Optical Society's Standards, Three-figure Logarithms, etc.

Copies 2s. each, Post Free, may be obtained of

THE HATTON PRESS, Ltd., 125, Fleet Street, London, E.C.4

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

FOR critical clients of the female sex



To misquote Byron, "Appearance is of man's life a thing apart; 'tis woman's whole existence." With her, *appearance* is first thought and second nature; the birthright of the Eternal Eve.

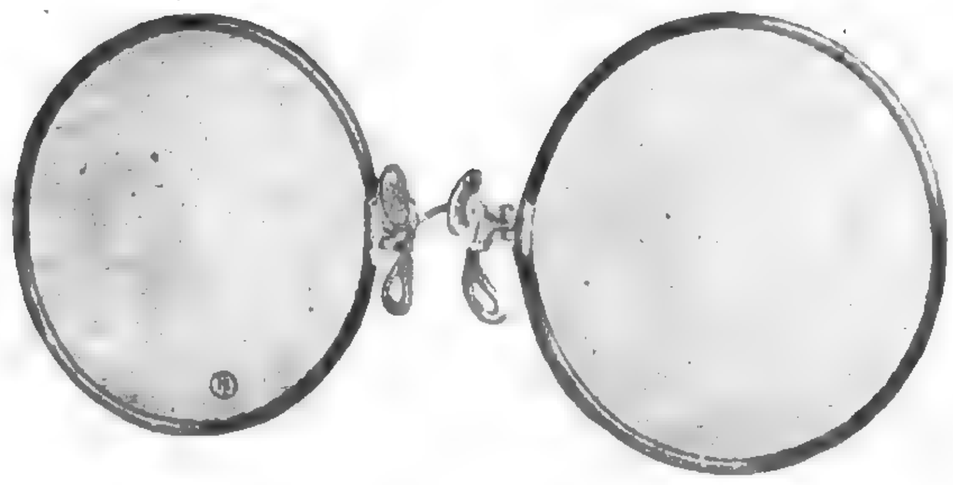
With Realfit Finger Piece Frames or mountings you can satisfy every whim of your clients—men or women. Realfits are made to combine comfort, beauty and long wear.

The skilful construction makes a Realfit as comfortable as a well-worn shoe; the 1/10—12 K gold-filled metal throughout assures excellent service.

Let your wholesaler supply you with Realfit Finger Pieces in all standard sizes and complete assortment of guards.

REALFIT NJ OPTICAL PRODUCTS

NEW JERSEY OPTICAL Co.,
Newark, N.J. . . . . U.S.A.



REALFIT *Finger Piece.*

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

The Employment Bureau.

A.—**Advertisements unaccompanied by cash cannot be inserted.** *B—Charge for SITUATIONS VACANT: the first 20 words 2s 6d; additional words, 1s 6d up to 10 and so on at the same rate; replies under Box number 8d C.—Charge for SITUATIONS WANTED: 1s. up to 20 words additional words 6d. up to 10; and so on at the same rate: replies under Box number 8d. D.—Announcements displayed in black-faced type, 3d. for each word. E—LATEST DATE for copy Wednesday morning preceding publication.*

Advertisements notifying wages or salary cannot be accepted

F.S.M.C., F.I.O., open for engagement, locum or permanent. Box 5881, c/o "The Optician," 125, Fleet Street, E.C.4.

CHEMIST-OPTICIAN seeks engagement, locum or permanent. Box 5882, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C. seeks position, manager or first assistant. Good salesman. 29, Old Compton Street, W.

LENS WORKER (Instrument) wanted for workshop in S.E. London. All-round experience and initiative required. Apply, stating particulars to Box 5885, c/o "The Optician," 125, Fleet Street, E.C.4.

LADY requires position, first-class optician, seven years' experience general optics, capable sight-tester and saleswoman. Used to sole charge. Box 5886, c/o "The Optician," 125, Fleet Street, E.C.4.

COMPETENT Skilful Refractionist, F.S.M.C. (33) with extensive managerial experience desires appointment. Experienced in prescription work and possessing sound practical knowledge of refraction gained from busy practice. Box 5867, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS Rimless fitter, edger and setter requires situation. Apply, G.F.K., 4, Affleck Street, Pentonville Road, N.

TRAVELLER, keen, dependable man, with experience, seeks change. Age 32. Any ground, London preferred. Box 5873, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS Lens surfacer requires situation, 9 years' experience with London firms. Apply, J. S., 80, Prebend Street, Islington, N.1.

CAPABLE Assistant wanted for E. London branch. Good opening for man with sound practical sight-testing experience. Reply, Box 5880, c/o "The Optician," 125, Fleet Street, E.C.4.

EXPERIENCED Refractionist (27) desires situation at home or abroad, used to management. Knowledge of photography. Last position 10 years. Box 5879, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., age 26, relinquishing own business, seeks position April. Capable refractionist, fitter and repairer. Box 5861, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST CLASS rimless fitter seeks situation, edging and bifocal worker, age 21. Wholesale and retail experience. London or suburbs preferred. Box 5860, c/o "The Optician," 125, Fleet Street, E.C.4.

FIRST-CLASS Surfacer requires situation, anywhere in England. 7 years' experience of best work. F. C. Taylor, 68, Trehurst Street, Clapton, E.5.

YOUNG LADY seeks position with retail optician. Several years' West End experience in all shop and prescription work. Conscientious worker. Reply, Box 5862, c/o "The Optician," 125, Fleet Street, E.C.4.

MECHANIC used to meteorological and general instrument work, hand-turning bench, finishing and lacquering. 18 years' experience, any distance, town or country. F. Orford, 83, Ashmore Road, Paddington, W.9.

SMART MAN required with good experience of sight-testing knowledge of astro-telescopes and general optical goods an advantage. Reply, giving particulars of age, experience and salary required to Box 5887, c/o "The Optician," 125, Fleet Street, E.C.4.

F.S.M.C., D.B.O.A., 22, wants position as first assistant or manager, in a good class business. Box 5879, c/o "The Optician," 125, Fleet Street, E.C.4.

GLAZIER (male expert) rimless and bevel, desires situation, done little cutting, drilling and fitting. 7, Clarendon Road, West Green, N.15.

OPTICIAN desires situation as first assistant, tall, age 24, F.S.M.C. Has good knowledge of photography and all optical instruments. Apply, Box 5863, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT (21) requires situation, wholesale or retail, used to fitting, drilling, edging and repairs. C., 66, Kingswood Road, Fulham, S.W.6.

YOUNG MAN (25) manufacturing experience in optics, seeks post in sales department. Good references. Write, T.D., 251, East India Dock Road, E.14.

RELIABLE Man desires engagement as traveller, stockkeeper, or any position in the optical trade, 20 years' experience, excellent references. Box 5868, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT Wanted, take charge small branch, workshop knowledge, soldering, etc. Sight-testing preferred, not essential. State salary, references, first letter. Box 5871, c/o "The Optician," 125, Fleet Street, E.C.4.

D.B.O.A. (24), desires position with sight-testing optician in Manchester or district, 6 years' practical experience and first-class references. Box 5866, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, young, keen, capable and adaptable, is in need of position. Well educated. Has good knowledge of sight-testing. Box 5865, c/o "The Optician," 125, Fleet Street, E.C.4.

MECHANIC requires situation, 22 years' experience, 14 years in optical machine shop, lens tools, press tools, turning, fitting, etc. W. Tucker, 766, Holloway Road, Upper Holloway, N.19.

F.S.M.C. (nine years qualified) London experience, highest credentials, requires post with view to partnership in well established business, in or near London. Box 5872, c/o "The Optician," 125, Fleet Street, E.C.4.

ASSISTANT, 21, passed first part S.M.C. Refractionist, well up in all repairs, edging, cutting, rimless mounting. Highly recommended by present employer. Box 5864, c/o "The Optician," 125, Fleet Street, E.C.4.

SMART YOUNG MAN (22) seeks situation. Warehouse or lens department. Thorough general knowledge. Box 5859, c/o "The Optician," 125, Fleet Street, E.C.4.

GLAZIER, male, edging and rimless fitting, piece-work if desired or rimless fitting at home. L.R., 6, Fairfield South, Kingston-on-Thames.

POSITION required in any capacity by young man, 27, who wishes to learn the business. London or suburbs. Box 5869, c/o "The Optician," 125, Fleet Street, E.C.4.

APPRENTICESHIP required for a well educated youth, with well established provincial optician, to live in. 118, Wellington Road, South Hounslow.

CAPABLE Man wanted for sight-testing, must be good salesman, and reliable watch jobber, permanency to good all-round man. State age, wage required, experience and particulars to Box 5848, c/o "The Optician," 125, Fleet Street, 125, Fleet Street, E.C.4.

OPTICAL Engineering. Associate Royal College of Science seeks engagement with a manufacturing firm. Age 27. Physicist and mathematician. Box 5846, c/o "The Optician," 125, Fleet Street, E.C.4.

Concluded on page 6.

Digitized by Google
Original from THE OHIO STATE UNIVERSITY

If you Employ Surfacing Tools,

It will be of interest to you to know that we now undertake for our Customers

the CORRECTION of

Spherical, Cylindrical and

Toric Tools.

Our charges are reasonable and the work is done promptly and accurately.

When next your tools require correction, kindly send them through your wholesaler to

UNITED KINGDOM OPTICAL CO., LTD.,

(Wholesale and Export Only.)

MILL HILL, LONDON, N.W.7

Digitized by Google

Original from THE OHIO STATE UNIVERSITY

AMERICAN OPTICAL COMPANY, LIMITED.

PROTECT YOUR NAME AND PROFESSION.



Unless you are absolutely sure of the trial set with which you make your examinations, even your most careful work may not be correct through no fault of yours. In order to protect your own name and the reputation of the profession, you should know that your trial set is accurate.

Wellsworth Trial Sets, with the A.O.Co. name plate, are as perfect as skilled workmen and science can make them. Every lens is individually tested, and must coincide with a master lens that has been certified as to focus.

Your wholesaler can supply you with Wellsworth Trial Sets in several sizes. When buying, protect yourself by insuring that the A.O.Co. name plate is on the Trial Case.

WELLSWORTH

TRADE MARK (Regd.)

OPTICAL PRODUCTS.

Offices, No. 39 Hatton Garden, E.C., LONDON

Published by The Hatton Press, Ltd., at the Editorial and Advertisement Offices, 123, 124 and 125, Fleet Street, London, E.C.4. Printed by The Century Press, Tilbury. Feb. 17, 1922.

Digitized by Google Original from THE OHIO STATE UNIVERSITY

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

-09-1-07-07-01

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

-09-1-07-07-01

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY

The Ohio State University
3 2436 001799848
OPTICIAN
QC350O615
001
V62

THE OHIO STATE UNIVERSITY BOOK DEPOSITORY
D AISLE SECT SHLF SIDE POS ITEM C
8 02 35 08 8 04 004 8

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY